C 81486 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

Biomedical Engineering

BM 09 405—LINEAR INTEGRATED CIRCUITS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. A differential amplifier has a differential voltage gain of 2000 and common mode gain of 0.2. Determine CMRR in dB
2. What is Differentiator ?
3. How active filters are superior than passive filter ?
4. What is the function of a voltage regulator ?
5. Mention any *four* characteristics of an ideal operational amplifier.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Analysis in the term of Constant Current Source.
7. In the Fig 1 The Bridge is slightly unbalanced and the input voltages with respect to ground are $E_1 = 5\ V + 2\ mV$ and $E_2 = 5\ V - 2\ mV$, Determine :
   (a) The Input Signal Voltage. (2½ marks)
   (b) The Common Mode Voltage. (2½ marks)

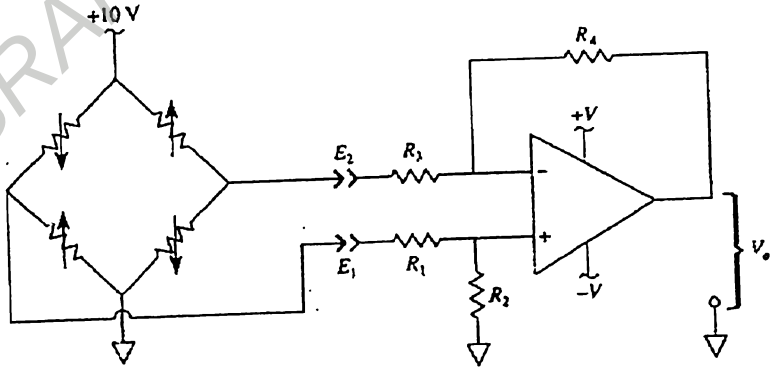


Fig. 1

Turn over

8. Sketch the Block diagram of Basic Pulse Generator ? Why the Monostable Multi-vibrator is triggered by the negative-going edge of the Square wave ?

9. Draw the Circuit Connections as a LM 380 Power Audio Power Amplifier.

10. Compare the Differentiation and Integration.

11. State Features and Parameters of Function Generator IC 8038.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) Consider a Inverting amplifier $R_1 = 10\ K\Omega$, $R_f = 100\ K\Omega$, $V_i = 1\ V$. A load of 25 KΩ is connected to the output terminal. Calculate : (i) i_1 ; (ii) v_0 ; (iii) i_L and total current i_o into the output pin, also using the parameter draw the Op-amp Circuit.

Or

(b) Discuss in detail about Frequency Compensated Operational amplifier.

13. (a) (i) Explain in the term of summer op amp with types. (7 marks)

(ii) What is Transconductance amplifier ? (3 marks)

Or

(b) Draw the Circuit for Log amp with saturation and Temperature compensation and derive the equations for Log amplifier.

14. (a) Derive an expression of a stable multi-vibrator.

Or

(b) Draw the circuit of a second order Butterworth low pass filter and derive its transfer function.

15. (a) Explain the concept of Voltage Regulators using 78XX and 79XX Series.

Or

(b) Draw and explain the Functional Block diagram of 723 voltage regulator and how this IC can be used as Low voltage.

(4 × 10 = 40 marks)

C 81479 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

Printing Technology Engineering

PT 09 405—ELECTRONIC CIRCUITS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

Each question carries 5 *marks.*

1. Define the various *h*-parameters in a transistor.
2. Explain about self-bias and fixed bias.
3. What is the need for biasing in transistor Amplifier ?
4. Explain shunt voltage feedback.
5. What is the function of power amplifier ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

6. What are the advantages of *h*-parameters ?
7. Define *h*-parameters and hence derive *h*-parameter model of a CE-BJT.
8. What is biasing ? Discuss the factors causes for bias instability in a transistor.
9. Explain the working of series resonant crystal oscillator.
10. Explain working of a Hartley oscillator.
11. Explain about wide band amplifiers.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. (a) Derive the expressions for Z_i, Z_0 and A_υ for common drain JFET amplifier.

Or

(b) Using small signal low frequency hybrid model for the CE amplifier with a load of Z_L and source resistance R_s derive expression for A_I, A_v, Z_i and Z_o.

13. (a) Consider a fixed bias circuit of a transistor. Obtain expressions for stablity factor S_{ICO}, S_{VBE} and S_β. Draw the circuit diagram.

Or

(b) List the difference between :

(i) Enhancement and depletion mode of MOSFET ; and

(ii) JFET and MOSFET.

14. (a) Obtain an expression for frequency of oscillation in Colpitt 's oscillator.

Or

(b) For a voltage series feedback amplifier topology, obtain expression for A_v and R_{if}. Also explain the principle of voltage amplifier used in feedback amplifiers.

15. (a) Derive an expression for second harmonic distortion in power amplifiers, using 3-point method.

Or

(b) Explain Class A power amplifier and derive its efficiency.

(4 × 10 = 40 marks)

C 81478 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

Printing Technology Engineering

PT 09 404—THEORY OF MECHANISM

Time : Three Hours Maximum : 70 Marks

Assume missing data suitably.

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is meant by completely constrained motion ?
2. Differentiate between higher and lower pair with examples.
3. Define addendum and module with reference to a gear.
4. What is meant by the term creep in belt drives ?
5. Define cycle and frequency.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions out of six.*

6. What is a Kinematic Pair ? Explain its classification based on the type of contact between the elements with examples.
7. Explain the four bar mechanism.
8. What is a differential gear of an automobile ? How does it function ?
9. State and derive the law of gearing.
10. Explain open belt drive with a neat sketch.
11. Explain different types of free vibration.

(4 × 5 = 20 marks)

Turn over

Part C

All questions *are* **compulsory** *with choice to answer any* **one** *between the sub-questions.*

12. (a) From the following data draw the profile of a cam in which the knife edge follower moves with simple harmonic motion during ascent while it moves with uniformly accelerated and decelerated motion during descent :

Least radius of the cam is 50 mm, angle of ascent 75°

Angle of dwell between ascent and descent 60°

Angle of descent 105°

The lift of the follower 40 mm

Distance between line of action of the follower and axis of cam 20 mm

If the cam rotates at 360 r.p.m., find the maximum velocity and acceleration of the follower during ascent and descent.

Or

(b) The crank of a slider crank mechanism rotates at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position.

13. (a) A 200 involute pinion having 22 teeth meshes with a gear to give a velocity ratio of 0.5. The two gears have a module pitch of 4 mm and standard addendum. Find the length of path of contact, arc of contact and contact ratio between the two gears.

Or

(b) Figure 1 shows an epicyclic gear train in which gear A drives the internal gear D through compound gears B and C. The number of teeth on gear A is 20 and centre distance between the centers of gears A and B is 300 mm. If the module of all gears is 10 mm and gear C has 30 teeth, find the speed of gear D. The arm rotates at 600 r.p.m. in the counter-clockwise direction and gear A is fixed.

14. (a) A shaft carries four rotating masses A, B, C and D in this order along its axis. The mass A may be assumed concentrated at a radius of 12 cm, B at 15 cm, C at 14 cm, and D at 18 cm. The masses A, C and D are 15 kg, 10 kg and 8kg respectively. The planes of rotation of A and B are 15 cm apart and B and C are 18 cm apart. The angle between the radii of A and C is 90°. If the shaft is in complete dynamic balance, determine : i) the angles between the radii of A, B and D ; ii) The distance between the planes of revolution of C and D ; and iii) the mass B.

Or

(b) An open belt running over two pulleys 24 cm and 60 cm diameters connects two parallel shafts 3 m apart and transmits 3.75kW from the smaller pulley that rotates at 300r.p.m.; coefficient of friction between the belt and the pulleys is 0.3 and the same working tension in 100 N/cm width. Determine : 1) minimum width of the belt ; 2) initial belt tension ; and 3) length of the belt required.

15. (a) A machine of 75 kg is mounted on springs and is fitted with a dashpot to damp out vibrations. There are three springs of stiffness 10 N/mm and it is found that the amplitude of vibration diminishes from 38.4 mm to 6.4 mm in two complete oscillations. Assuming that the damping force varies as the velocity; determine : (i) the resistance of the dashpot at unit velocity ; (ii) the ratio of the frequency of the damped vibration to the frequency of the undamped vibration ; (iii) the periodic time of the damped vibration.

Or

(b) The mass of a single degree damped vibrating system is 7.5 kg and makes 24 free oscillations in 14 seconds when disturbed from its equilibrium position. The amplitude of vibration reduces to 0.25 of its initial value after five oscillations. Determine : (i) stiffness of the spring, (ii) logarithmic decrement ; and (iii) damping factor.

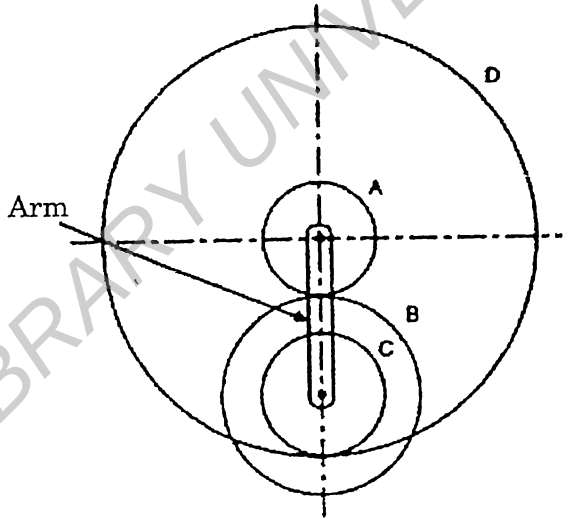


Figure 1

(4 × 10 = 40 marks)

C 81477 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

Instrumentation and Control Engineering

IC 09 406—ELECTRIC CIRCUITS AND NETWORK THEORY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

Each question carries 2 *marks.*

1. Find the Laplace transform of $(2 - 2e^{-2t})/t$.
2. Why are step inputs most commonly used for analysis as a test input signal ?
3. What are the significance of poles and zeros ?
4. Why are hybrid parameters called so ?
5. What are the characteristics of butterworth filter ?

(5 × 2 = 10 marks)

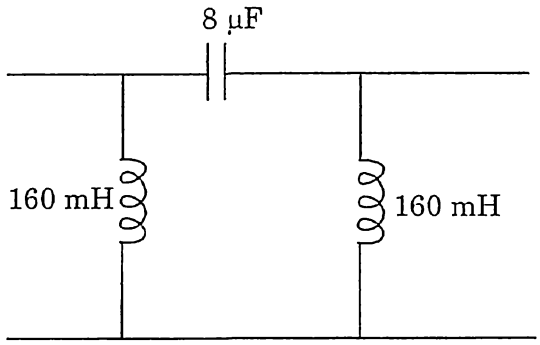
Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

6. Verify the initial value theorem for the function $f(t) = e^{-t}(\sin 3t + \cos 5t)$.
7. A 500 ohm resistor, a 16 mH inductor and a 25 mF capacitor are connected in parallel. Express the admittance of this parallel combination of elements as a rational function of S.
8. List the properties of driving point functions.
9. Derive the expressions of Y parameters in terms of h parameters.
10. Design a low-pass filter with T section having a cut-off frequency of 1 kHz to operate with a terminated load resistance of 500 ohms.

11. Determine the cut- off frequency of the high-pass filter shown in circuit.

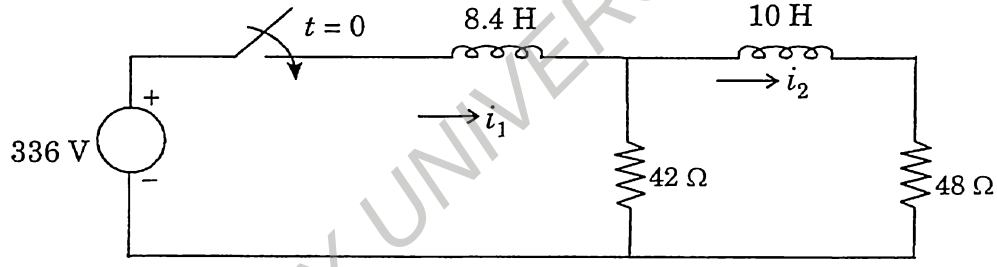


(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) Obtain the expression for i_1 and i_2 in the circuit shown when d.c. voltage is suddenly applied. Assume that the initial energy stored in the circuit is zero.



Or

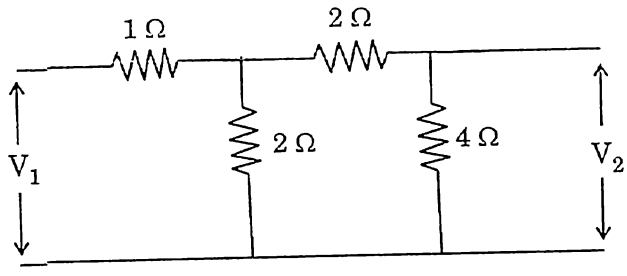
(b) With necessary diagram and derivation, explain how a LC circuit responds to a ramp input.

13. (a) Explain the properties of driving point functions.

Or

(b) For the network function $V(s) = \dfrac{5(s+5)}{(s+2)(s+7)}$ draw the pole zero diagram and hence obtain the time domain response $i(t)$.

14. (a) Find the h-parameters of the network shown :



Or

(b) Design a T type attenuator to give an attenuation of 100 dB and to work in a line of 800 ohms impedance.

15. (a) Compare low-pass, high-pass, band-pass and band stop filters.

Or

(b) Explain the design procedure of low-pass Butterworth filter and list its properties.

(4 × 10 = 40 marks)

C 81475 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2020

Production Engineering

PE 09 406—THERMAL ENGINEERING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. State Zeroth law of thermodynamics.
2. What is meant by enthalpy ?
3. By referring to the steam table, determine the latent heat of vaporization of steam at 1.1 MPa.
4. Differentiate between 'single acting' and 'double acting' reciprocating compressors.
5. Write the equation to mathematically represent heat conduction Fourier law.

(5 × 2 = 10 marks)

Part B

Answer any **four** *out of six.*
Each question carries 5 *marks.*

6. The properties of a closed system change by following the relation between pressure and volume as $pV = 2.8$, where p is in bar and V is in m^3. Determine the work done when the pressure increases from 1 bar to 5 bar.
7. A closed system undergoes a reversible process at constant pressure process of 2 bar and its volume changes from 0.2 cubic metre to 0.07 cubic metre. 20 kJ of heat is rejected by the system during the process. Determine the change in internal energy of the system.
8. An engine 30 cm bore and 40 cm stroke works on Otto cycle. The clearance volume is 1800 cubic cm. the initial pressure and temperature are 2 bar and 70°C respectively. If the maximum pressure is limited to 30 bar, find the following (i) the air standard efficiency of the cycle ; and (ii) the mean effective pressure of the cycle. Assume the ideal conditions.

9. A refrigerator uses K-134a as the working fluid and operates on a ideal vapour compression cycle between 0.2 MPa and 0.9 MPa. If the mass flow rate of the refrigerant is 0.08 kg/sec, determine i) the rate of heat removal from the refrigerator space, ii) the power input to the compressor, iii) the heat rejection rate in the condenser, iv) the COP.

10. With the aid of a simple sketch, describe the working of an absorption type refrigerator.

11. Determine the loss of heat through the wall of a rotating sphere shaped boiling pan with an inner diameter of 1.6 m and wall thickness of 18 cm. Irmer surface temperature is 180°C and the outer surface temperature is 45°C. The thermal conductivity of the material is 0.12 W/m°C. If the surrounding atmosphere is at 27°C, find the convective heat transfer coefficient of the outer surface of the sphere wall.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. (a) (i) A reversible heat pump is required to be used to maintain a temperature of 0°C in a refrigerator when it rejects the heat to the surrounding at 26°C. If the heat removal rate form the refrigerator is 1400 kJ/min, determine the COP of the machine and work input required.

(ii) If the required input to run the pump is developed by a reversible engine which receives heat at 350°C and rejects heat to atmosphere, then determine the overall COP of the system.

Or

(b) Two kg of water at 80°C is mixed with 2 kg of water at 11 °C in an isolated system. Calculate the change of entropy due to the mixing process.

13. (a) An oil engine with 20 cm cylinder diameter and 30 cm stroke works on theoretical diesel cycle. The initial pressure and the temperature of the air used are 12 bar and 25°C. The cut-off is 10% of the stroke. Find the following i) Pressure and temperature at all salient parts, ii) theoretical air standard efficiency, iii) mean effective pressure, iv) the power developed by the engine if the working cycles per minute are 350. Assume the compression ratio is 16 and working fluid is air.

Or

(b) In a steam power plant, the condition of steam at turbine inlet is 90 bar, 450°C and the condenser pressure is 0.15 bar. The heat source comprises a steam of exhaust gases from a gas turbine discharging air at 480°C and 1 atm pressure. The minimum temperature allowed

for the exhaust gas is 400K. The mass flow rate of the hot gas is such that the heat input rate to the steam cycle is at 90MW. The ambient condition is given by 300K and 1 atm. Determine η_1, work ratio and η_2 of the following cycles, i) Basic Rankine cycle, without superheat, ii) Rankine cycle with super heat, iii) Rankine cycle with reheat such that steam expands in the h.p. turbine until it exists as dry saturated vapour, iv) Ideal regenerative cycle, with the exit temperature of the exhaust gas taken as 330 °C, because the saturation temperature of steam at 90 bar is close to 310°C.

14. (a) For a Roots blower, the inlet pressure is 1.1 bar and the pressure ratio is 1.5. The induced volume of air is 0.04 m^3/rev. Estimate the work input. What would be the work input for a vane type compressor, if the internal combustion takes place through half the pressure range ?

Or

(b) A refrigerating machine using F_{12} as working fluid works between the temperatures 20°C and 38°C. The enthalpy of liquid at 38°C is 440 kJ/kg. The enthalpies of F_{12} entering and leaving the compressor are 565 kJ/kg and 600 kJ/kg respectively. The rate of circulation of the refrigerant is 3 kg/min and efficiency of compressor is 0.8. Determine i) Capacity of the plant in tons of refrigeration, ii) Power required to run the plant, and iii) COP of the plant.

15. (a) Find the amount of heat transfered through a rectangular cross-sectional area of fin made of a metal (K = 150 W/m°C) whose thickness is 4 mm and height is 8 cm when the width of fin is 1.1 m. Also determine the temperature at the tip of the fin and the effectiveness of the fin.

Or

(b) (i) Hot water at 75°C flowing in a parallel flow heat exchanger at the rate of 9 kg/min is to be cooled to 45°C by means of cold water available at 20°C and passing at the rate of 20kg/min. Calculate the area of the heat exchanger if the individual heat transfer co-efficients are 1380 W/m^2 °C. Also calculate the outlet temperature of hot and cold water in this heat exchanger if the hot water is rate is doubled. Individual heat transfer co-efficients are proportional to 0.8^{th} power of flow rate.

(4 × 10 = 40 marks)

C 60546 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2019

Aeronautical Engineering

AN 09 405—MECHANICS OF SOLIDS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define stress.
2. What is mean by positive or sagging bending moment ?
3. What are the assumptions made in Torsion equation ?
4. What are the methods for finding out the slope and deflection at a section ?
5. Define principle stresses and principle plane.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. A circular rod 1 m long and 15 mm diameter is subjected to an axial tensile load of 30 KN. Find the elongation of the rod if the modulus of elasticity of the material of the rod is 120 KN/mm^2.
7. Define the modulus of rigidity and Poisson's ratio.
8. A cantilever beam 3 m long carries a load of 20 KN at its free end. Calculate the shear force and bending moment at a section 2 m from the free end.
9. Sketch (a) the bending stress distribution (b) shear stress distribution for a beam of rectangular cross section.
10. Find the torque which a shaft of 50 mm diameter can transmit safely, if the allowable shear stress is 75 N/mm^2.
11. The principal stress at a point are 100 N/mm^2 (tensile) and 50 N/mm^2 (compressive) respectively. Calculate the maximum shear stress at this point.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) A bar 30 mm in diameter was subjected to a tensile load of 54 KN and measured extension on 300 mm gauge length was 0.112 mm and change in diameter was 0.00366 mm. Calculate Poisson's ratio and the values of three elastic modulii.

Or

(b) A reinforced concrete column 500 mm × 500 mm in section is reinforced with 4 steel bars of 25 mm diameter, one in each corner, the column is carrying a load of 1000 KN. Find the stresses in the concrete and steel bars. Take E for steel = 210×10^3 N/mm^2 and E for concrete = 14×10^3 N/mm^2.

13. (a) A solid shaft is subjected to a torque of 100 Nm. Find the necessary shaft diameter if the allowable shear stress id 100 N/mm^2 and the allowable twist is 3° per 10 diameter length of the shaft. Take C = 1×10^5 N/mm^2.

Or

(b) A beam of length 10 m is simply supported at its ends carries two concentrated loads of 5 KN each at a distance of 3 m 7 m from the left support and also a uniformly distributed load of 1 KN/m between the point loads. Draw shear force and bending moment diagrams. Calculate the maximum bending moment.

14. (a) A timber of rectangular section is to support a load of 20 KN uniformly distributed over a span of 3.6 m, when the beam is simply supported. If the depth of the section is to be twice the breadth and the stress in the timber is not to exceed 7 N/mm^2, find the breadth and depth of the cross section.

Or

(b) Find the deflection at the free end of the cantilever beam of span 3 m carrying a point load of 50 KN at free end. EI = 360000 kNm^2.

15. (a) Find the Euler critical load for a hollow cylindrical cast iron column 150 mm external diameter, 20 mm wall thickness if it is 6 m long with hinged at both ends. Assume Young's modulus of cast iron as 80 KN/mm^2. Compare this load with that given by Rankine formula. Using Rankine constants a = 1/1600 and 567 N/mm^2.

Or

(b) Stresses at a point are px = –80 N/mm^2, py = –35 N/mm^2, q = 11.5 N/mm^2. Determine principal planes, principal stresses and maximum shear stress.

(4 × 10 = 40 marks)

C 60543 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2019

Biotechnology Engineering

BT 09 403—CHEMICAL REACTION ENGINEERING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define Homogenity.
2. Define kinetics.
3. What are catalysts ?
4. Define ETD.
5. What is an ideal reactor ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Explain temperature dependent term of reaction rate.
2. Explain non-ideal flow.
3. What are multiple reactions ?
4. Explain C curve.
5. Mention internal transport defects.
6. Explain slurry reactor.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

1. Explain three types of ideal reactors.

Or

2. Describe and classify type of reactions with special reference to eg.

3. Explain recycle reactor.

Or

4. Explain autocatalytic reactor.

5. Explain RTD in detail.

Or

6. Explain segregation model.

7. Explain moving bed reactor.

Or

8. Explain slurry reactor.

(4 × 10 = 40 marks)

C 60542 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2019

Biomedical Engineering

BM 09 406—MICROPROCESSORS AND INTERFACING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. How many operations are there in the instruction set of 8085 ?
2. How do 8086 interrupts occur ?
3. What are important signals of Intel 8086 ?
4. List the operating modes of 8253 timer.
5. What is the output modes used in 8279 ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. List all the interrupt signals of 8085 microprocessor.
7. Differences between I/O mapped I/O and Memory mapped I/O.
8. List the segment register of 8086.
9. Write notes on status flag.
10. Write an assembly language program to add two 2-digits BCD Number.
11. Briefly explain 8279 controller and list the features of 8279.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. (a) Explain the requirement of a program counter, stack pointer and status flags in the architecture of 8085 microprocessor.

Or

(b) Explain the instruction set of 8085 microprocessor in detail with one example for each group.

13. (a) Discuss about the multiprocessor configurations of 8086.

Or

(b) Describe any five addressing modes of 8086 with suitable examples.

14. (a) Write an assembly language program to find out the largest from a given unordered array of 8 bit numbers :

Stored, in a location starting from a known address.

Or

(b) Draw the block diagram of 8086 mp and explain.

15. (a) Draw the Block diagram of 8279 and explain the functions of each block.

Or

(b) Explain major components of 8259 with the aid of suitable diagram.

(4 × 10 = 40 marks)

C 60540 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2019

Biomedical Engineering

BM 09 404—ELECTRONIC INSTRUMENTATION

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define absolute error and gross error.
2. What is meant by calibration ?
3. What are the limitations of integrating ADCs ?
4. Mention two applications for PLL.
5. What is the principle of watt-hour meter ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Discuss the frequency response characteristics of 1st order instrument for step input.
7. Explain the basic principle of time base generator.
8. Draw a monostable multivibrator using 555 timer and explain.
9. With block diagram, brief on distortion meter operation.
10. Draw the block diagram of electrostatic deflection in CRO and explain.
11. Explain in brief on instrument transformers.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

1. (a) Describe the various types of measurement errors and methods of correction in measuring instruments.

Or

(b) Explain the dynamic characteristics associated with measuring instruments.

Turn over

2. (a) With block diagram, discuss the working of arbitrary waveform generator.

Or

(b) Explain the operation of PLL and its applications.

3. (a) With schematic, explain the working of Master-slave DACs. What are its advantages and disadvantages ?

Or

(b) Explain the operation of sampling oscilloscopes.

4. (a) Draw the schematic of X-Y recorder and explain.

Or

(b) Explain the working of peak response voltmeter with diagram.

(4 × 10 = 40 marks)

C 60436 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2019

Biomedical Engineering

BM 14 404—ELECTRONIC INSTRUMENTATION

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of ten :

1. Define calibration and state its advantages.
2. What is the use of Schering Bridge ?
3. What are the types of errors associated with digital-to-analog converters (DACs) ?
4. What are the advantages of dual slope over ramp type DVMs ?
5. Draw the basic block diagram of a signal generator.
6. What is a sweep frequency generator ?
7. Differentiate Marker generator and Sweep marker generator.
8. State why time delay is necessary in oscilloscopes.
9. Define deflection sensitivity.
10. Differentiate Maxwell Bridge and Anderson Bridge based on its working methodology.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11. What is the need for standards of measurements ? How they are classified ? Explain.

Or

12. Explain the functionality adopted in unknown frequency measurement in a Wien bridge.
13. Describe with block diagram, the operation of a ramp type Digital voltmeter.

Or

14. Draw the circuit diagram for *n*-bit binary weighted resistor DAC and obtain an expression for output voltage.

Turn over

15. Explain the different types of signal generators along with their features, advantages and disadvantages.

Or

16. Describe the principle of operation and need for Q meter.

17. Draw the diagram of analog cathode ray oscilloscope and describe its operation.

Or

18. Explain with a neat block diagram the working and the functionalities of a XY recorder.

(4 × 15 = 60 marks)

C 60529 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2019

Instrumentation and Control Engineering

IC 09 403—CONTROL ENGINEERING—I

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

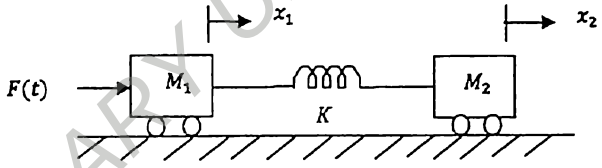
1. Mention the basic elements of a closed loop system.
2. Name test signals used in a control system.
3. What is the stability condition at which the roots are in imaginary axis in S plane ?
4. What are the frequency domain specifications ?
5. What is a lag compensator ? Give an example.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Consider the two masses-spring system shown in the figure below. Determine $X_2(s)/F(s)$.



7. Distinguish between open loop and closed loop systems.
8. By Routh-Hurwitz criterion, check the condition for stability of the given system : $a_0 s^4 + a_1 s^3 + a_2 s^2 + a_3 s + a_4 = 0$.
9. How phase margin is determined from Bode plot ?

Turn over

10. What is a PD controller and what are its effects on system performance ?

11. The damping ratio and natural frequency of oscillation of a second order system is 0.5 and 8 rad/sec respectively. Calculate the resonant peak and resonant frequency.

(4 × 5 = 20 marks)

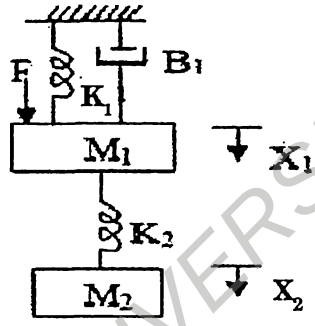
Part C

Answer **all** *questions.*

12. (a) Determine the transfer function of armature controlled DC motor.

Or

(b) Write the differential equations governing the behaviour of the mechanical system shown in the figure below. Draw the force voltage and force current electrical analogous circuits and verify, by writing mesh and node equations.



13. (a) The open loop transfer function of the system given as :

$$\frac{2}{s(s+4)(s+6)}.$$

Determine the positional, velocity and acceleration error constants. Determine the steady state errors with ramp input $r(t) = t$ and acceleration input $r(t) = \left(\frac{1}{2}\right)t^2$.

Or

(b) Sketch the root locus of the system whose open loop transfer function is given by :

$$G(s) = \frac{K}{s(s+2)(s+4)}.$$

14. (a) Sketch the polar plot for the given unity feedback system having an open loop transfer function $G(s) = \frac{K}{s(1+0.5s)(1+5s)}$ and determine the value of K so that the gain margin is 20 db.

Or

(b) For the open-loop transfer function : $G(s)H(s) = \frac{6}{(s+1)(s+2)}$.

Determine the stability of the closed-loop system by Nyquist criterion.

15. (a) For a certain system, $G(s) = \frac{0.025}{s(1+0.5s)(1+0.05s)}$.

Design a suitable lag compensator to give, velocity error constant = 20 sec^{-1} and Phase margin = 40°.

Or

(b) Explain the design of Lead-Lag compensator using bode plot and root locus.

(4 × 10 = 40 marks)

C 5387 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2021

Biomedical Engineering

BM 14 406—MICROPROCESSORS AND INTERFACING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. What is the function of IO / M signal in the 8085 ? Explain.
2. What is the need for ALE signal in 8085 microprocessor ?
3. What are the different addressing modes of 8085 ? Explain.
4. Explain the clock frequency of 8086.
5. Discuss the functions of instruction queue in 8086.
6. List the various addressing modes present in 8086.
7. Draw control word format for Bitset/Reset for 8255 IC.
8. Explain the output modes used in 8279.
9. List the features of 8051 microcontroller.
10. Give steps to program 8051 for serial data transfer.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. Draw and explain the timing diagram of memory read cycle.

Or

12. Draw the functional block diagram of 8085 microprocessor and explain.
13. Describe Intel 8086 microprocessor architecture.

Or

14. Explain various data addressing modes of 8086 with the help of examples.

15. Explain any one of the modes of 8255 in detail.

Or

16. Explain the block diagram of the 8279 keyboard/display interface and its operation.

17. Describe the architecture of 8051 with neat diagram.

Or

18. With the help of a functional block diagram, explain any one application of 8051 microcontroller.

(4 × 15 = 60 marks)

C 5386 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2021

Biomedical Engineering

BM 14 405—LINEAR INTEGRATED CIRCUITS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. State the ideal characteristics of an operational amplifier.
2. Define slew rate. In what way does it possess impact on the performance of an op-amp circuit.
3. Explain about the ideal op-amp.
4. Explain the operation of Zener crossing detector.
5. Explain the working of analog multiplier.
6. What is sample and hold circuit ? What is the need for it ?
7. Explain the operation of RC phase-shift oscillator using op-amp. What is the gain of the op-amp circuit and significance of 3 RC networks ?
8. Explain the operation of Wein-bridge oscillator. Derive the expression for its frequency of oscillation.
9. Briefly explain any two applications of 555 timer in astable model
10. Explain any two applications of PLL in brief.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. Draw and explain about the equivalent circuit of Op-Amp.

Or

12. Draw the detailed internal diagram of op-amp and explain each block with simplified circuit diagram. Add a note on PSRR.

(12 + 3 = 15 marks)

13. With neat circuit diagram explain about instrumentation amplifier.

Or

14. Explain the following :

    (i) Precision diode ; (ii) Precision rectifier ; (iii) Peak detector.

15. Design a second order band-pass filter with a midband voltage gain of 34 dB, corner frequency 150 Hz and a 3 dB band width B = 16 Hz.

Or

16. Explain the switched capacitor filter. What are its advantages compared to simple RC filters ?

17. (a) Explain the operation of an astable and monostable multivibrators with necessary diagams.

(10 marks)

(b) State the significant differences between fixed and adjustable voltage regulators.

(5 marks)

Or

18. Explain the working principle and salient features of triangular wave generator and saw tooth wave generator.

[4 × 15 = 60 marks]

C 5385 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2021

Biomedical Engineering

BM 14 403—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Test whether the following system of equation represent LTI system :
   (i) $y(t) = [\cos 3t]\, x(t)$.
   (ii) $y[n] = [-n]$.
2. Explain signals along with the classification of signals.
3. Examine whether the following system are time invariant or not :
   (a) $y(t) = tx(t)$; (b) $y[n] = x\,[2n]$.
4. Find the frequency response of the following causal system :
   $y[n] = \frac{1}{2}x[n] + x[n-1]$.
5. Find the Fourier transform of the given signal $x(t) = e^{-at}\, u(-t)$, $a > 0$.
6. Find the Fourier transform of the discretge signal $x(n) = a\{n\}$, where $|a| < 1$.
7. Define DTFT and prove its convolution property.
8. What is meant by the frequency response of discrete time systems ?
9. With a simple example, explain the partial fraction method of computing inverse z-transform.
10. Find the z-transform of $x(n) = (0.2)^n\, u(n)$. Plot its ROC.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. The input and output of a causal LTI system are related by the differential equation $d^2y(t)/dt^2 + 6dy(t)/dt + 8y(t) = 2x(t)$. Find the impulse response of the system.

Or

12. Determine the transfer function and impulse response for the casual LTI system described by difference equation :

$$y(n) - (1/4)Y(n-1) - (3/8)Y(n-2) = -x(n) + 2x(n-1).$$

13. Consider a causal, stable LTI system whose input $x(n)$ and output $y(n)$ are related by the second order difference equation : $y(n) - (1/2)y(n-1) - (1/2)y(n-2) = x(n)$. Determine the impulse response and unit step response of the given system.

Or

14. (a) Find the Fourier series for the periodic signal $x(t) = t$, $0 \leq t \leq 1$ and repeat every 1 sec. (10 marks)

(b) Explain the conditions under which any periodic wave form can be expressed using Fourier series. (5 marks)

15. Determine the Fourier transform of the discrete time rectangular pulse of amplitude A and length L i.e. $x[n]$ = A for $0 = n = L - 10$ otherwise.

Or

16. Consider a causal discrete time LTI system whose input $x[n]$ and output $y[n]$ are related by the difference equation :

$$Y[n] - \frac{1}{4} y[n-] = x[n].$$

Find the Fourier series representation of output $y[n]$ if $x[n]$ = sin $(n3\pi/4)$.

17. State and prove the time delay theorem of z-transform.

Or

18. (a) Analyze and characterize the LTI system using z-transform.

(b) Determine the stability and causality for the LTI system with difference equation $y(n) - (1/2)y(n-1) = x(n) + (1/3)x(n-1)$.

[4 × 15 = 60 marks]

C 5384 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Printing Technology Engineering

PT 14 406—ELECTRONIC COMPOSITION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

Each question carries 5 *marks.*

1. What is the importance of good design? Explain.
2. What is texture ? What are the ways by which texture can be obtained in design ? Explain.
3. Explain the importance of typography in advertising.
4. WYSIWYG, expand and explain its significance in Electronic Publishing.
5. What is the role of color in design ? Explain.
6. Proofing is the most essential stage in design. Justify this statement.
7. Explain the different ways by which text and graphics can be incorporated in design.
8. What are the benefits of Electronic Composition ?
9. What are the general rules for page makeup ? Explain.
10. Differentiate between Postscript and Encapsulated Postscript.

(8 × 5 = 40 marks)

Part B

Answer **all** *the questions.*

Each question carries 15 *marks.*

11. (a) What way Desktop publishing decisions affect the print production. Explain with an example.

Or

(b) What are the steps involved in designing of a folder ? Explain in detail.

Turn over

12. (a) What is proofing ? Explain the different proofing stages in design.

Or

(b) What is the significance of proportion and rhythm in design ? Explain with an example.

13. (a) Explain the difference between Heavy duty and Medium duty software and their role in DTP.

Or

(b) Explain rendering intents. How do rendering intents aid design ?

14. (a) What is color management ? What is its importance ?

Or

(b) What are the considerations to be made in designing of a Newspaper ? Explain each stage.

(4 × 15 = 60 marks)

C 5383 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Printing Technology Engineering

PT 14 405—INSTRUMENTATION AND CONTROL SYSTEM

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions out of ten.*
Each question carries 5 *marks.*

1. Sketch and explain variable capacitive transducer elements with applications.
2. Write short notes on calibration procedures for pressure transducer.
3. State and explain different types of errors.
4. Explain the method of measuring strain on rotary shaft.
5. Explain the measurement of principal strain using 3-element rectangular rosette gauge
6. Explain the working principle of pneumatic load cell for the measurement of force.
7. Explain the principle of conversion in bourdon tube pressure gauge.
8. What is a servo mechanism ? Explain its operation.
9. Define (i) Delay time ; (ii) Rise time ; (iii) Peak time ; (iv) Peak overshoot ; and (v) Settling time.
10. How feedback control system is applied for temperature control of boiler.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. (A) Explain the following static characteristics of measurement system : (a) Range ; (b) Sensitivity; (c) Linearity ; (d) Hysteresis ; (e) Resolution ; (f) Accuracy ; and (g) Precision.

(B) Describe the elements present in the generalized measuring system using block diagram.

(8 + 7 = 15 marks)

Or

Turn over

12. (A) What are the various errors occur in the measuring instruments and explain the methods of elimination.

(B) Describe the construction and working of capacitive transducer and state its advantages.

(8 + 7 = 15 marks)

13. (A) Explain the two-arm and four-arm conditions used for strain measurements ?

(B) With the help of suitable diagrams, derive the expressions for Quarter Bridge and half bridge circuits of Wheatstone bridge used for stain measurement. Give applications of each.

(7 + 8 = 15 marks)

Or

14. (A) Why bridge circuit is necessary for a strain gauge ? Explain how the bridge circuit is used with a strain gauge.

(B) Define strain Rosette. How it is used for strain measurement ?

(10 + 5 = 15 marks)

15. (A) Explain the method of measuring force using a pneumatic load cell and state its advantages.

(B) Discuss the constructional features of Bourdon-tube pressure guage.

(8 + 7 = 15 marks)

Or

16. Describe the construction, working and theory of a McLeod gauge for measurement of vacuum. List their advantages and disadvantages. (15 marks)

17. Explain home heating control system with a control loop block diagram. (15 marks)

Or

18. (A) Define steady state response and steady state error. Derive the expressions for peak time and rise time in terms of ξ and w_n for a second order control system.

(B) What is a feedback system ? Why negative feedback is invariably preferred in a closed loop system ?

[4 × 15 = 60 marks]

C 5382 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Printing Technology Engineering

PT 14 404—MECHANICS OF SOLIDS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions from 1 to 10.*
Each question carries 5 *marks.*
Missing data, if any can be suitably assumed.

1. List the sign conventions used while constructing the Mohr's circle.
2. A steel rod 15 m long is at a temperature of 15 °C. Find the free expansion of the length when the temperature is raised to 65 °C. Find the temperature stresses produced when, the expansion of the rod is prevented and when the rod is allowed to expand by 6 mm.
3. A cylinder with closed ends is subjected simultaneously to an internal pressure of 0.60 MPa, bending moment of 64 kNm and a torque of 16 kNm. Determine the maximum tensile stress and shearing stress in the wall. Dimensions of the cylinder-50 cm internal diameter and 2 cm wall thickness.
4. Draw SFD and BMD for a simply supported beam of span 6m. For a total length of 2m from the centre a UDL of 2kN/m acts downward. At a distance from 1m from either ends point load of 1 kN and 4 kN acts down. Least among the point load is on the left side of the beam.
5. What are beams of Uniform Strength ? Give examples.
6. Derive the expression for maximum slope and deflection at the free end of a cantilever beam with concentrated load at free end by double integration method.
7. A beam with a span of 4500 mm carries a point load of 30 kN at 3000 mm from the left support. If for the section, $I_{xx} = 54.97 \times 10^{-6}$ m^4. Take E = 200 GN/m^2. Determine, the deflection under the load; position and amount of maximum deflection.
8. Prove that for the same material, length and weight, hollow shafts can transmit higher torque than solid shafts.
9. List any 5 functions of springs.
10. Derive Eulers formula for a column when one end is fixed and other is free.

(8 × 5 = 40 marks)

Turn over

Part B

Answer **all** *the questions.*

11. (a) At a point in material under stress, the intensity of the resultant stress on a certain plane is 50MN /m^2 (tensile) inclined at 30° to the normal of that plane. The stress on a plane at right angles to this has a normal tensile component of intensity of 30 MN/m^2. Solve graphically and thus find :

    1) The resultant stress on the second plane ;

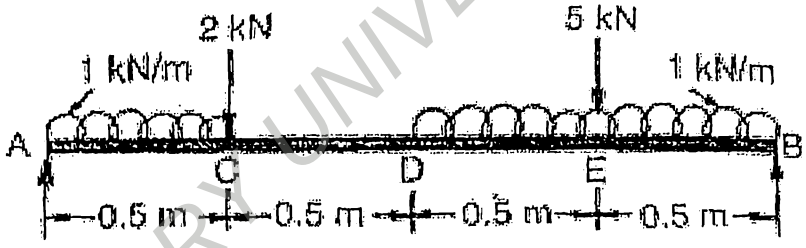
    2) The principal planes and stresses ;

    3) The plane of maximum shear and its intensity.

Or

(b) Direct stresses of 120MN/m^2 in tension and 90 MN/m^2 in compression are applied to an elastic material at a certain point on planes at right angles to another. If the maximum principal stress is not to exceed 150MN/m^2 in tension, to what shearing stress can the material be subjected ? What is then the maximum resulting shearing stress in the material ? Also find the magnitude of the other principal stress and its inclination to 120MN/m^2 stress. Solve Analytically.

12. (a) Draw the B.M and S.F diagrams for the beam shown in the Fig and hence find the maximum shear force and bending moment.



Or

(b) A T-beam 200mm × 150mm × 10mm is used over a span of 3 meter. It carries uniformly distributed load of 12000N per meter run. Find the position of the neutral axis and the maximum stress induced in the beam due to bending. Also state the nature of maximum bending stress (i.e., whether tensile or compressive).

13. (a) A beam AB of 4 metres span is simply supported at the ends and bears a UDL of 10 kN/m for a length of 2m from the right and a point load of 20 kN acting downwards at the mid span of the remaining length. Draw the arrangement and hence determine : (1) deflection at C (2) maximum deflection (3) slope at the end A.

Given : $E = 200 \times 10^6 kN/m^2$ and $I = 20 \times 10^{-6} m^4$.

Or

(b) A simply supported beam of span / carries a point load W not at mid span. Using conjugate beam method determine the slopes at the end of the beam and the deflection under the load.

14. (a) A cylindrical shell 3m long which is closed at the ends has an internal diameter of 1m and a wall thickness of 15mm. Calculate the circumferential and longitudinal stresses induced and also change in the dimensions of a shell if it is subjected to an internal pressure of $1.5MN/m^2$. Take E : $200GN/m^2$ and I/m = 0.3.

Or

(b) (i) A solid shaft of mild steel 200mm in diameter is to be replaced by hollow shaft of alloy steel for which the allowable shear stress is 22 percent greater. If the power to be transmitted is to be increased by 20 percent and the speed of rotation increased by 6 percent determine the maximum internal diameter of the hollow shaft. The external diameter of the hollow shaft is to be 200mm.

(ii) A closed coiled helical spring of 100mm mean diameter is made of 10mm diameter rod and has 20 turns. The spring carries an axial load of 200N. Determine the shearing stress. Taking the value of modulus of rigidity = $84GN/m^2$ determine the deflection when carrying this load. Also calculate the stiffness of the spring and frequency of free vibrations for a mass hanging from it.

(8 + 7 = 15 marks)

[4 × 15 = 60 marks]

C 5381 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Printing Technology Engineering

PT 14 403—OFFSET MACHINERY—I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

1. Explain the functions of pile height governor and suckers.
2. Explain about the feed board with a neat diagram.
3. Explain the principles of offset lithography with a neat diagram.
4. Explain the chain delivery system.
5. Write the procedure to set the ductor roller to fountain roller and transfer roller.
6. Elaborate on five basic elements of sheet fed offset lithographic press.
7. Write about the methods to maintain the inking system.
8. Explain the single-color sheet fed press with a neat diagram.
9. What is perfecting ? How is perfecting done on offset presses ? Explain with diagram.
10. Explain the different types of blanket used in offset press.

(8 × 5 = 40 marks)

Part B

11. Explain the conventional offset inking system with a neat diagram.

(15 marks)

Or

12. Explain the working principles of sheet registration systems used on sheetfed presses.

(15 marks)

13. Explain the principles of three types of infeed mechanisms used on sheet-fed presses with diagrams.

(15 marks)

Or

Turn over

14. a) Explain about sheet cleaners, antiset-off spray unit and ink agitators. (9 marks)

b) describe about driven and non-driven ink rollers. (6 marks)

15. What about make ready operations carried out on sheet-fed presses for each job.

(15 marks)

Or

16. a) What are inker feed and plate feed dampening systems ? Discuss with diagrams.

(10 marks)

b) Explain the dampening roller coverings. (5 marks)

17. Define the following problems. Also write their causes and remedies :

i Register problem.
ii Hickeys.
iii piling.
iv Ghosting.
v Dot gain.

(15 marks)

Or

18. Define the following problems. Also write their causes and remedies :

i Set off.
ii Scumming.
iii Snow flaking.
iv Tinting.
v Picking.

(15 marks)

[4 × 15 = 60 marks]

C 5376 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Production Engineering

PE 14 403—THEORY OF MACHINES

Time : Three Hours Maximum : 100 Marks

Part A

1. Describe the Planar, helical and spherical kinematic pairs with a kinematic sketch.
2. "A free form curve is to be traced to 1 : 2 scale in an engraving machine". Identify the type of mechanism to be used and brief about the working of the identified mechanism.
3. What is coriolis component of acceleration ? In which cases does it occur ? Brief with an example.
4. What is interference in gears ? Also, list the methods that can be employed to avoid under cutting in gears.
5. Compare the features and applications of spur, helical and bevel gears.
6. Define the following terms as related to cam and follower mechanism : (i) Pressure angle ; (ii) Prime circle diameter ; and (iii) Trace point.
7. 'The friction drives are fail safe drives'-Justify, by considering the belt drive.
8. Describe the characteristics of the following free longitudinal vibrating systems : (i) Under damped ; (ii) Critically damped ; and (iii) over damped.
9. State the significance of node and relative amplitude of vibration in a free torsional vibrating system.
10. State the condition for static and dynamic balancing of rotating masses with analytical expressions. Also, list any four examples each for static and dynamic unbalance in rotating masses.

(8 × 5 = 40 marks)

Part B

11. For the four-bar linkage shown in Fig.1, the angular velocity of crank 2 is a constant 16 rad/s cw. Find the of point B and the angular velocity of links 3, 4. What will be the velocity of rubbing at B ? If the radius of the journal at the pin joint is 20 mm. Given that, AO_2 = 350 mm, BA = 425 mm, O_4O_2 = 100 mm, and BO_4 = 400 mm.

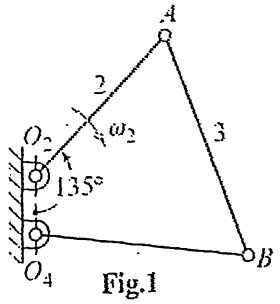


Fig.1

Or

12. Fig.2 shows configuration of an engine mechanism. The dimensions are as follows : Crank, AO = 200 mm, connecting rod, AB = 600, AD = 200 mm. At the instant, the crank has an angular velocity of 50 rad/s CW and an angular acceleration of 800 rad/s^2 CW. Calculate the acceleration of D and B. Also, find the angular acceleration of AB. The angular velocity of AB is 8.5 rad/s.

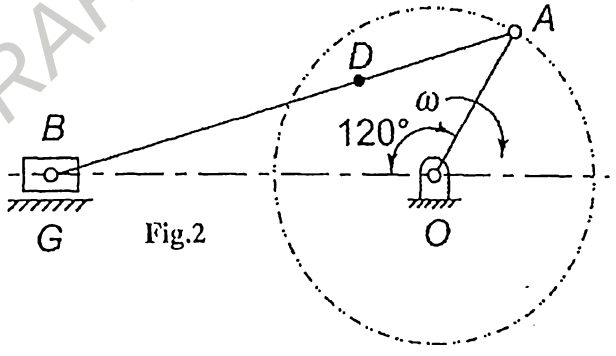


Fig.2

13. The following date related to a pair of 20° involute gears are in mesh : module = 6 mm, number of teeth on pinion and the gear are 17 and 49, addendum = 1 module. Find the number of pairs in contact, the ratio of sliding to rolling motion when the tip of a tooth on the larger gear wheel (i) Is just making contact ; (ii) Is just leaving contact, with its mating tooth ; and (iii) Is at the pitch point.

Or

14. Two shafts A and B are coaxial. The gear C (50 teeth) is rigidly mounted on shaft A. The compound gear D-E meshes with C and an internal gear G. The gear wheel D has 20 teeth and meshes with C and E has 35 teeth which meshes with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement, find : (i) The number of teeth on internal gear G ; and (ii) The speed of shaft B, if the shaft A rotates at 110 r.p.m. Assume all the gears are of same module.

15. A cam of base circle diameter 60 mm is to operate a roller follower of 20 mm diameter. The follower is to have simple harmonic motion during ascent and uniform velocity during descent. The angular speed of the cam is 360 r.p.m. Draw the cam profile for the cam for a lift of 40 mm. Angle of ascent = 60°, angle of dwell 40°, and angle of descent 90°, followed by angle of dwell again. Also, calculate the maximum velocity and acceleration during ascent.

Or

16. The following data related to a flat belt drive : Power transmitted = 18 kW, pulley diameter = 180 cm, angle of contact = 175°, speed of pulley = 300 r.p.m., co-efficient of friction between belt and pulley is 0.3, permissible stress for the belt = 300 N/cm^2, thickness of belt = 8 mm, density of belt material = $0.95 \times 10^{-5} g/cm^3$. Determine the width of belt required by considering the centrifugal tension in to account.

17. A shaft of length 3 m is supported by long bearings at the ends. Shaft carries three point loads of masses 100 kg, 150 kg, and 75 kg at 1 m, 2 m and 2.5 m respectively from the left support. Also an additional mass of 200 kg is distributed uniformly along the length of the shaft. Take E = 200 GN/m^2. Determine the transverse natural frequency of the shaft.

Or

18. The shaft shown in the Fig.3 is to be balanced by adding counter masses in planes L and R. The mass of the three masses m_1, m_2 and m_3 are 80, 60 and 70 kg respectively. The dimensions R_1, R_2 and R_3 are 125, 150 and 100 mm respectively. The axial distance between the bearings and the weights are a = 25 mm, b = 300 mm, c = 600 mm, d = 150 mm and e = 75 mm respectively. Calculate the magnitudes of the counter masses and their angular locations. The radial distance of counter masses are to be added is 100 mm.

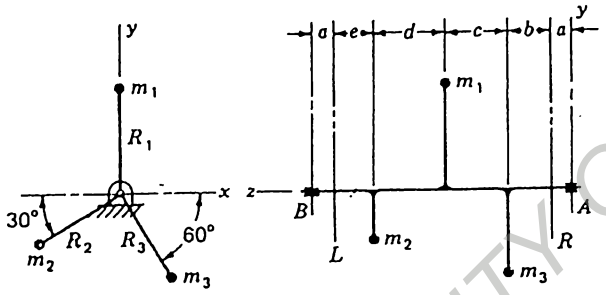


Fig.3

(4 × 15 = 60 marks)

C 5375 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation

AI 14 406—ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Define reproducibility.
2. Draw the block diagram of standard signal generator.
3. Enlist the applications of RF signal generator.
4. Define Linearity of potentiometer.
5. Draw the circuit of Maxwells Inductance Bridge.
6. What is Dynamic range in ADC ?
7. Draw the circuit of DAC with weighted resistors configuration.
8. Define accuracy in the context of converters.
9. Sketch the diagram of CR tube used in CRO.
10. Explain the steps involved in measuring Q.

(8 × 5 = 40 marks)

Part B

Answer **one** *question from each Module.*
Each question carries 15 *marks.*

11. (a) Describe the statistical parameters associated with measuring instruments and its formulae.

Or

(b) Explain the working of Frequency selective wave analyser.

Turn over

12. (a) Describe the characteristics of non-linear potentiometer.

Or

(b) Describe in detail the bridge that is used widely for measuring Unknown medium resistance.

13. (a) Describe the steps involved in voltage based conversion in DAC.

Or

(b) Explain the operation of successive approximation ADCs with relevant diagrams.

14. (a) Explain the basic components of Analog X-Y plotter and list its advantages and applications.

Or

(b) Describe the operation of Fundamental suppression Harmonic distortion analyser.

(4 × 15 = 60 marks)

C 5374 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation

AI 14 405—ELECTRONIC CIRCUITS—II

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

Each question carries 5 *marks.*

1. Write short notes on wave shaping circuits.
2. Enlist the advantages of sweep circuits.
3. Differentiate monostable and astable multivibrators.
4. Discuss the significance of time base generators.
5. What is the function of timer IC555 ?
6. Describe the function of Voltage shunt feedback circuit.
7. What is the significance of phase margin in oscillator circuits ?
8. Define gain stability with feedback.
9. Evaluate maximum efficiency of series fed circuit.
10. Discuss impedance transformation of dass A amplifier.

(8 × 5 = 40 marks)

Part B

Answer **one** *question from each module.*

Each question carries 15 *marks.*

11. (a) Describe the function of MOSFET as a switch in detail.

Or

(b) Describe the significance and operation of UJT sweep circuit.

12. (a) Describe the role of time base signal in time base generators.

Or

(b) Describe triangular wave generator with relevant illustrations.

13. (a) Describe the feedback circuits with relevant illustrations.

Or

(b) Describe the series and parallel crystal oscillator operation and characteristics.

14. (a) Draw and describe the circuit diagram of a Class A transformer-coupled amplifier using an *n-p-n* transistor.

Or

(b) Describe the circuit of a quasi-complementary amplifier using relevant waveforms.

(4 × 15 = 60 marks)

C 5372 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation

AI14 403—LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

1. Enumerate the steps involved in Silicon wafer preparation.
2. Sketch the Ion Implantation stage of IC Fabrication.
3. Explain Metallization.
4. Describe the terminal structure of Op-amp.
5. Draw the Equivalent circuit for inverting op-amp.
6. Define CMRR.
7. Design a circuit for Photoconductive detector using Op-amp.
8. Investigate the effect of resistance mismatches in difference amplifiers of Op-amp.
9. Define Capture range of PLL.
10. Draw the timing diagram of Phase detector using PLL.

(8 × 5 = 40 marks)

Part B

Answer **one** *question from each Module.*

11. (a) Describe the common methods for fabrication of Integrated capacitors in detail.

Or

(b) Draw and describe the fabrication of FET.

12. (a) Evaluate the expressions for Non-inverting op-amp Configuration.

Or

(b) Describe in detail how the basic Op-amp act as a summing amplifier.

13. (a) Describe how Op-amp can be used to detect a non-zero level.

Or

(b) Derive relevant expressions for non-inverting amplifier and its ideal equivalent circuit.

14. (a) Explain the operation of Digital Phase detector using relevant Diagrams.

Or

(b) Describe how PLL can act as an FSK Demodulator.

(4 × 15 = 60 marks)

C 5371 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Information Technology Engineering

IT 14 406—DIGITAL DATA COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer **eight** *questions.*

Each question carries 5 *marks.*

1. Compare BPSK, QPSK and DPSK.
2. Explain signal propagation delay.
3. Elaborate on linear block codes.
4. Explain the use of parity bit in error detection.
5. What is datagram ? Explain its significance in communication.
6. Draw the structure of a switch.
7. Brief about the working of data link layer.
8. What is need for framing ?
9. Define Piggybacking and explain its usefulness.
10. Explain any *two* protocols for noiseless channel.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

Each question carries 15 *marks.*

11. (a) Explain about the unguided media for transmission.

Or

(b) Explain the various multiplexing techniques in detail.

(a) Design the encoder for (7, 4) cyclic code generated by G (P) = $p^3 + p + 1$ and verify its operation for any message vector.

Or

(b) Elaborate in detail on cyclic codes and hamming codes.

(a) Describe the various multiplexing techniques in detail.

Or

(b) Explain about the various circuit switched networks in detail.

(a) With a neat sketch, explain the working of HDLC.

Or

(b) Explain the protocols used for noiseless channel.

(4 × 15 = 60 marks)

C 5370 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Computer Science and Engineering

CS 14 406—MICROPROCESSOR BASED DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Explain the features of the 80386 processor.
2. State the need for memory segmentation in 8086 processor. Explain the types of segmentation and also mention its advantages.
3. Explain the common function signals used in 8086 with appropriate examples.
4. Write a note on modular programming in 8086 processor.
5. Explain any *five* string instructions with appropriate examples.
6. With relevant examples, explain the usage of procedures.
7. Write about the usage of the Dos 21 H and BIOS 10H Functions.
8. Explain about the I/O address decoding mechanism.
9. Explain the operational principles of DMA and highlight its advantages.
10. Describe the procedure for interfacing an Analog-to-Digital Converter with the 8086 processor.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. A) Explain the maximum and minimum mode signals of the 8086 processor with appropriate examples.

Or

B) With a neat sketch, explain the working of the 80486 processor along with its memory management techniques.

Turn over

12. A) Write an 8086 ALP to sort the given input in ascending order.

Or

B) Write a 8086 ALP to generate the Fibonacci Sequence.

13. A) Explain in detail about the keyboard interfacing mechanism.

Or

B) Explain the types of interrupts with its suitable applications.

14. A) Explain the working of the Programmable Interval Timer 8253/8254 in detail.

Or

B) Explain the working of the Programmable Peripheral Interface (PPI)-8255A along with its modes of operation.

(4 × 15 = 60 marks)

C 5369 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Computer Science and Engineering

CS/IT 14 405—SYSTEMS PROGRAMMING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

I. 1 Explain about RISC machines.

2 Write short notes on AXI assembler.

3 Explain the steps followed to design an assembler.

4 What are the data structures used in macro processor ? Explain conditional macro expansion.

5 Explain any 5 basic functions used while designing the loader.

6 Define macros with an example.

7 How are external references handled by automatic library search process in loaders ? Explain.

8 Explain about OS services.

9 Write short notes on virtual machines.

10 Explain in brief the basic principles of operating systems.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

II. a) Explain in detail the system software machine architecture.

Or

b) Explain the assembler design and assembler design options.

III. a) Explain the following : (i) loaders and linkers (ii) machine dependent loader.

Or

b) Explain the following basic loader functions : (i) design of an absolute loader (ii) Bootstrap loader.

Turn over

a) Explain in detail the basic macro processor functions.

Or

b) Explain the general design of the macro processor.

a) Explain about system calls and system structure in detail.

Or

b) Explain in detail the operating system structure with neat diagram.

(4 × 15 = 60 marks)

C 5368 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2021

Computer Science and Engineering

CS/IT 14 404—OBJECT-ORIENTED PROGRAMMING IN JAVA

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. What are the four cornerstones in OOP ?
2. What are the features of object oriented programming ? Explain.
3. Write short notes on catching exceptions.
4. Explain about polymorphism.
5. Write a note on final keyword.
6. Describe about inter thread communication.
7. Explain about the features of multi thread programming in Java.
8. What is multithreading ? Explain.
9. Write short notes on SQL.
10. What is scrollable and updatable result sets.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11. Explain briefly about the object oriented concepts with neat diagram.

Or

12. Explain about Debugging techniques and using a debugger.
13. Explain constructors with examples.

Or

14. Explain in detail about various types of inheritance in Java with neat diagram.

15. Explain in detail different states of a thread.

Or

16. What is synchronization ? Explain the different types of synchronization in Java.

17. Explain in detail about design of JDBC.

Or

18. Discuss about basic JDBC programming concepts and query execution.

(4 × 15 = 60 marks)

C 5367 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Computer Science and Engineering

CS/IT 14 403—DATA STRUCTURES AND ALGORITHMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Describe the use of sparse matrices.
2. Define feasible solution and optimal solution.
3. What is a Queue ? Explain its operations with example.
4. Write the algorithm for converting infix expression to postfix expression.
5. Differentiate between DFS and BFS.
6. Write the recursive tree traversal algorithm for in order, pre order and post order traversals.
7. Write a short note on AVL trees.
8. Sort the following numbers using Merge sort procedure and discuss the time complexity and space complexity of this Algorithm :

   34, 67, 28, 45, 97, 54, 9, 10,60
9. Briefly explain the various Hashing techniques.
10. Explain the working of sequential search with an example.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 15 *marks.*

11 a) How can the complexity of algorithms be evaluated for different algorithms ? Explain with examples.

Or

b) What is Recursion ? Explain recursive algorithms with example.

Turn over

12 a) Give the prefix and postfix form of the following given expression :

(i) $(A - B * C - D)/(E + F)$;

(ii) $\big((A + B) * C - (D - E) \wedge (F + G)\big)$; and

(iii) $A + B * (C - D)/P$.

Or

b) Write the algorithm for converting infix expression to postfix expression. Convert the following Infix expression to postfix using stack $\big(A - (B + C)\big) * D) + \$ (E + F)$.

13 a) State and explain Dijkstra's algorithm with example

Or

b) What is binary search tree ? Construct a binary search tree by inserting the following data sequentially 45, 32, 70, 67, 21, 95, 92, 40

14 a) Sort the following numbers using Quick sort procedure and discuss the time complexity and space complexity of this algorithm :

42, 12, – 8, 98, 67, 83, 08, 104, 07

Or

b) Explain the Bubble Sort, Insertion Sort and External Sort with examples .

(4 × 15 = 60 marks)

C 5366 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 14 406—ANALOG COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

1. Define phasor and line spectra. Draw the time domain representation, phasor diagram and line spectrum of signal $A \cos(\omega t + \varphi)$.
2. What do you mean by frequency conversion ?
3. What are the parameters that determine the ability of a receiver ?
4. How Synchronization is achieved in TDM ?
5. Derive the condition of superposition for autocorrelation, power spectra and average power.
6. Define noise, thermal noise and white noise.
7. With block diagram, explain the linear CW modulation with noise.
8. List the properties of synchronously detected linear modulation with noise.
9. Tabulate the various continuous wave systems and compare the properties.
10. Brief about false pulse threshold effect.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

11. a) What is amplitude modulation ? Explain the AM signals and spectra.

Or

b) With neat diagram, explain the balanced and ring modulators.

Turn over

12. a) Elaborate about the spectral analysis in PPM.

Or

b) What is PLL ? Give the analysis of spectra and lock in condition of PLL.

13. a) What is statistical average ? Explain the various statistical averages of a random variable.

Or

b) Derive an expression for PDF of Gaussian PDF Probability models.

14. a) With neat diagram explain envelope detection and the effects of threshold.

Or

b) Draw the model of a CW communication system with noise. Derive the signal-to-noise ratio.

(4 × 15 = 60 marks)

C 5365 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 14 405—DIGITAL ELECTRONICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

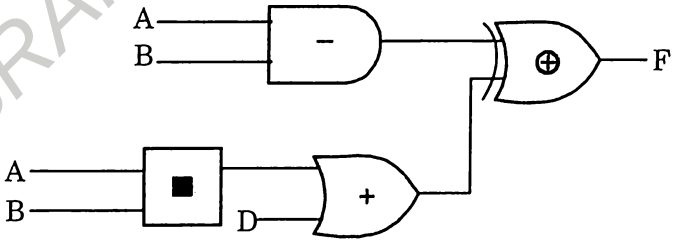
1. Simplify $Z = (AB + C)(B'D + C'E') + (AB + C)'$.
2. Plot the following function on a K-map. $F(A, B, C, D) = A'B' + CD' + ABC + A'B'CD' + ABCD'$.
3. Given the two binary numbers X = 1010100 and Y = 1000011, perform the subtraction : a) X-Y ; and b) Y-X by using 2's complement.
4. Explain the half adder circuit with its truth table and logic diagram.
5. What is a multiplexer ? Give its functional table and logic diagram of four-to-one line multiplexer.
6. What is a flip-flop ? How a clock pulse affects the operation of latch and flip-flop ?
7. How to implement T flip-flop using JK and D flip-flop ?
8. Brief about ring counter.
9. Write a note on state equations.
10. Define ASM. Explain the elements of ASM charts.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

11. a) (i) Write an expression for F and simplify :



ii) Factor $Z = ABC + DE + ACF + AD' + AB'E'$ and simplify it to the form (X + X) (X + X) (X + X + X + X) where each X represents a literal. Now express Z as a minimum sum of products in the form XX + XX + XX + XX.

Or

Turn over

b) Find a minimum sum of products solution to function using Quine-McCluskey method :

$f(a, b, c, d) = \sum m(1, 3, 4, 5, 6, 7, 10, 12, 13) + = \sum d(2, 9, 15)$

12. a) Elaborate the working of carry look ahead adders with logic expression and diagram.

Or

b) Construct a 4 input priority encoder. Derive an expression using *k*-map. Also give the logic diagram.

13. a) With neat diagram, explain the four bit universal shift register.

Or

b) With neat logic diagram, state diagram and state table, explain about Mod-N counter.

14. a) Elaborate in detail mealy state model.

Or

b) What are hazards ? Explain the types of hazards and the significance of hazards.

(4 × 15 = 60 marks)

C 5364 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

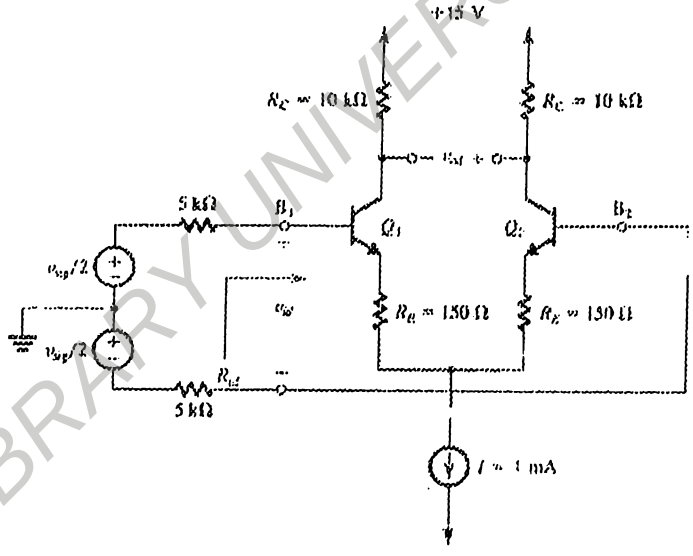
EC 14 404—ELECTRONIC CIRCUITS—II

Time : Three Hours Maximum : 100 Marks

Answer any **eight** *questions.*

Part A

1. What are the effects of negative feedback?
2. Explain how a feedback circuit works as an oscillator?
3. List the characteristics of quartz crystal.
4. Write a note on basic MOS differential amplifier.
5. The differential amplifier uses transistors with $\beta = 100$. Evaluate the following.
   i) Input differential resistance.
   ii) Overall differential voltage gain.



6. Write a note on transistor switch which is capacitive coupled.
7. Draw the emitter follower circuit with capacitive load with input and output waveforms.
8. Explain the application of Schmitt trigger as an amplitude comparator.
9. Derive the efficiency of series coupled class A amplifier.
10. Write a note on class D amplifiers.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

11. a) Derive the output impedance with feedback for voltage series and current series connections.

Or

b) Describe in detail about the voltage shunt feedback with diagram.

12. a) With neat diagram, explain the operation of MOS differential pair with differential mode input voltage.

Or

b) Derive the CMRR for BJT differential pair connections and derive the common mode input resistance.

13. a) Explain the working of transistor switch with inductive load.

Or

b) Explain the operation of miller sweep circuit.

14. a) Explain in detail about series fed class A amplifier.

Or

b) With neat diagram, explain the circuit operation of class AB power amplifier.

(4 × 15 = 60 marks)

C 5363 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 14 403—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

1. What is a system ? Give the block diagram and explain the elements of communication system.

2. A pair of sinusoidal signals with a common angular frequency is defined by $x_1[n] = \sin(5\pi n)$ and $x_2[n] = \sqrt{3}\cos(5\pi n)$.

   a) Specify the condition which the period N of both $x_1[n]$ and $x_2[n]$ must satisfy them to be periodic.

   b) Evaluate the amplitude and phase angle of the composite sinusoidal signal $y[n] = x_1[n] + x_2[n]$.

3. Define the terms invertible systems and deconvolution.

4. Use Parseval's theorem to evaluate $X = \sum_{-\infty}^{\infty} \sin^2(Wn)/\pi^2 n^2$.

5. Differentiate between decimation and interpolation.

6. Determine the laplace transform of $x(t) = e^{at}u(t)$ and depict the ROC and pole locations in the s-plane. Assume a is real.

7. Verify the differentiation property of the signal $x(t) - e^{at}u(t)$.

8. Give the relationship between transfer function and differential equations.

9. Define stability and causality of LTI systems using z-transform.

10. A stable and causal system is described by the difference equations :

$$y[n] + \frac{1}{4}y[n-1] - \frac{1}{8}y[n-2] = -2x[n] + \frac{5}{4}x[n-1].$$

Find the system impulse response.

(8 × 5 = 40 marks)

Turn over

Part B

Answer **all** *questions.*

11. a) Define system. List the properties of system and explain each one of them.

Or

b) Let the input $x[n]$ to a LTI system H be given by $x[n] = \alpha^n(u[n] - u[n-1])$ and the impulse response of the system be given by $h[n] = \beta^n u[n]$ where $0 < \beta < 1$. Find the output of this system.

12. a) Derive the periodicity and linearity property of Fourier Transform.

Or

b) The output of a system in response to an input $x(t) = e^{-2t}u(t)$ is $y(t) = e^{-t}(t)$. Find the frequency response and the impulse response of this system.

13. a) Describe in detail about the properties on the region of convergence of laplace transform.

Or

b) i) Find the inversion of laplace transform for LTI systems.

ii) Find the inverse laplace transform of $X(s) = \dfrac{3s+4}{(s+1)(s+2)^2}$.

14. a) Describe the transform analysis of LTI systems. Give the relation between transfer function and the difference equation.

Or

b) Elaborate about the properties on the region of convergence for the z-transform.

(4 × 15 = 60 marks)

C 5362 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 14 406—ELECTROMAGNETIC FIELD THEORY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **six** *questions.*
Each question carries 5 *marks.*

I. 1 Give any *three* co-ordinate systems.

2. How is the unit vectors defined in three co-ordinate systems ?

3. Give the relation between electric field intensity and electric flux density.

4. Distinguish between series and parallel circuits.

5. Write the relation between relative permeability and suspectibility.

6. State Gauss law for magnetic field.

7. State Faraday's law of induction.

8. What is the e.m.f. produced by moving loop in time varying field ? What is time harmonic field ?

9. Briefly explain about the wave incident Normally on perfect conductor.

10. Discuss about the plane waves in lossy dielectrics.

(8 × 5 = 40 marks)

Part B

Answer any **four** *questions.*
Each question carries 15 *marks.*

II. 1 (a) Define divergence, gradient, curl in spherical co-ordinate system with mathematical expression.

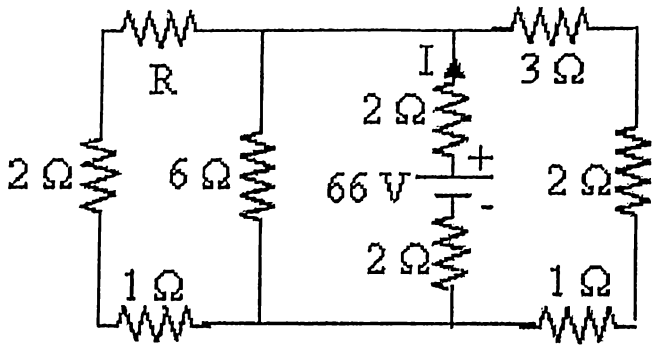
(b) Prove that divergence of a curl of a vector is zero, using stoke's theorem.

Or

2. Derive the boundary conditions of the normal and tangential components of electric field at the inter face of two media with different dielectrics.

Turn over

3. a) Find the value of resistance R, if the current is I = 11 A and source voltage is 66 V as shown in figure.



b) Four 60 W, 110 V bulbs are to be operated from a 230 V source. Determine the value of resistance connected in series with the line so that the voltage across the bulb does not exceed 110 V.

Or

4. (a) Derive the expression for torque developed in a rectangular closed circuit carrying current I a uniform field.

(b) An iron ring with a cross sectional area of 3 cm square and mean circumference of 15 cm is wound with 250 turns wire carrying a current of 0.3 A.The relative permeability of ring is 1500. Calculate the flux established in the ring.

5. (a) Find the total current in a circular conductor of radius 4 mm if the current density varies according to J = 104/R A/m^2.

(b) Given the conduction current density in a lossy dielectric as Jc = 0.02 sin 109 t A/m^2 find the displacement current density if = 103 mho/m and r = 6.5.

Or

6. The magnetic field intensity in free space is given as H = H0sin ay t A/m.where = t-z and is a constant quantity. Determine the displacement current density.

7. (a) Calculate the attenuation constant and phase constant for the uniform plane wave with the frequency of 10 GHz in a medium for which $\mu = \mu 0$, r = 2.3 and = 2.54 × 10^{-4}/m .

(b) Derive the expression for the attenuation constant, phase constant and intrinsic impedance for a uniform plane wave in a good conductor.

Or

8. (a) A uniform plane wave of 200 MHz, traveling in free space Impinges normally on a large block of material having r =4 , μr =9 and = 0. Calculate transmission and reflection co-efficient of interface.

(b) Derive wave equation in phasor form.

(4 × 15 = 60 marks)

C 5361 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 14 405—DIGITAL ELECTRONICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

I. 1 Convert 10002 into gray code and Excess 3 code.

2 Implement the following Boolean function with NAND-NAND logic $F = \sum (0, 1, 3, 5)$.

3 Elaborate the basic laws of Boolean alzebra with sample.

4 What is code converter ? Discuss their types.

5 Implement the following function using suitable multiplexer $F = \sum m(0, 2, 5, 7)$.

6 Give the classification of semiconductor memories.

7 Realize T Flip Flop using SR Flip-Flop.

8 Differentiate Asynchronous and Modulus counter.

9 Explain the signals HOLD, READY and SID.

10 Discuss the purpose of control word written to control register in 8255 ?

(8 × 5 = 40 marks)

Part B

Answer any **four** *questions.*
Each question carries 15 *marks.*

II. 1 i) Using K-map method, Simplify the following Boolean function and obtain :

(a) Minimal SOP ; and

(b) Minimal POS expression and realize using only NAND and NOR gates

$F = \sum m(0, 2, 3, 6, 7) + d(8, 10, 11, 15)$.

Or

Turn over

2 Simplify the 5 variable switching function using Karnaugh map $f(\text{EDCBA}) = \sum m(3, 5, 6, 8, 9, 12, 13, 14, 19, 22, 24, 25, 30)$.

3 (i) Draw and explain the BCD adder circuit.

(ii) Design a seven segment decoder circuit to display the numbers from 0 to 3.

Or

4 (i) Design a combinational circuit using ROM. The circuit accepts a three bit number and outputs a binary number equal to the square of the input number.

(ii) Describe the RAM organization.

5 (i) Design and explain the working of an 4-bit Up/Down ripple counter.

(8 marks)

(ii) Design and working of a synchronous MOD- 5 counter.

(7 marks)

Or

6 (i) Draw the logic diagram for a 5- bit serial load shift register using D FF and explain.

(10 marks)

(ii) Write notes on state minimization.

(5 marks)

7 Explain an interrupt process and the difference between a maskable and non-maskable interrupt by using examples.

Or

8 With a neat block diagram, explain in detail the internal architecture of 8255 and its registers.

[4 × 15 = 60 mark]

C 5360 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 14 404—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

I. 1 Explain all classification of signals with Examples for Each Category.

2 Determine, whether the systems described i/p and o/p equations are causal and linear :

$y_1(t) = x(t-3) + (3-t)$.

3 Distinguish between Continuous time signal and discrete time signal.

4 List out any three properties of continuous time trigonometric Fourier series.

5 Compare and contrast between Laplace transform and Fourier transforms.

6 Write the basic concept of BIBO stability.

7 Write the importance of discrete time Fourier series.

8 How discrete time filters are described with differential equations ?

9 Solve the difference equation $y(n) - 2y(n-1) = x(n)$ with $x(n) = (1/3)n\,u(n)$.

10 Discuss the various constraints on ROC.

(8 × 5 = 40 marks)

Part B

Answer any **four** *questions.*

II. 1 Find which of the following signals are causal or noncausal :

(i) $x(t) = e2t\,u(t-1)$; (ii) $x(t) = \cos 2t$; (iii) $x(t) = 2\,u(-t)$; (iv) $x(n) = u(-n)$; and (v) $x(n) = u(n+4) - u(n-2)$.

Or

Turn over

2 The given system is $y(n)$ = an $u(n)$. Check whether the following systems are :

(i) Static or dynamic ; (ii) Linear on non-linear ; (iii) Causal or non-causal ; (iv) Time invariant or time variant ; and (v) Stable on not stable.

3 Expand following function $f(t)$ by exponential Fourier series over the interval (0, 1). In this interval $f(t)$ is expressed as $f(t)$ = At.

Or

4 A linear shift-invariant system has a frequency response :

$H(e^{i\omega}) = e^{i\omega}\ (1/1.1 + \cos\omega)$

(a) Find its input-output relation in time domain.

(b) Find frequency response of a LSI system whose input and output satisfy the following difference equation :

$y(n) - 0.5y(n-1) = x(n) + 2x(n-1) + x(n-2)$.

5 State and prove sampling theorem for band limited signals using graphical approach.

Or

6 Find the DTFT of :

(i) $x(n) = (1/3)n\ u(n+3)$

(ii) $x(n) = (1/2)n$ for $n = 0, 2, 4,.....$

$= 0$ other wise

7 (a) Find the Laplace transform of : $x(t) = e - (t-2)(t-2)\ u(t-2)$.

(b) Find inverse of following Laplace transform :

$X(s) = (1/(s+1)) - (2/(s-1))$

If ROC is $-1 < \text{Re}(s)$.

Or

8 (a) State and prove z-transform time reversal property.

(b) Find the inverse z-transform of : $X(z) = (1/1 + 2z) + (2z/z - 0.25)$

(4 × 15 = 60 marks)

C 5359 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 14 403—ELECTRICAL MACHINES—I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **six** *questions.*

I. 1 Explain the significance of critical resistance in DC generators.

2 Briefly explain the effects of armature reaction.

3 Derive the EMF equation of DC generator

4 Explain the principle of operation of a DC motor.

5 Derive an expression for the torque generated in DC motor.

6 Why Swinburne's test is preferred instead of Brake test in DC machines ?

7 Draw and explain the approximate equivalent circuit of a transformer.

8 Write brief note on cooling of transformers.

9 Explain the limitations in electric machine design.

10 Explain the cruciform construction with neat diagram and calculate the area of core.

(8 × 5 = 40 marks)

Part B

Answer any **four** *questions.*

II. 1 a) The armature of 6 pole dc generator has a wave winding containing 664 conductors. Compute the generator EMF when flux per pole is 0.06 Weber and the speed is 250 RPM. At what speed must be the armature an EMF of 250 V if the flux per pole is reduced to 0.058 Weber.

(10 marks)

b) Explain the function of commutator in d.c. machine.

(5 marks)

Or

2. a) Explain the load characteristics of d.c. compound generator. (5 marks)

b) State the need for parallel operation. What are the conditions to be satisfied to connect to DC generators parallel ? Explain.

(10 marks)

3. a) Explain, what is the need for speed control of DC machines. How to achieve the above rated speed in DC shunt motor ?

(8 marks)

b) A 500 V dc shunt motor has Ra = 1.5 Ω and Rsh = 400Ω respectively. When running on no load the current taken is 5 A and the speed is 1000 r.p.m. Calculate the speed when motor is fully loaded and the total current drawn from the supply is 30 A. Also estimate the speed at this load, if the shunt field current is reduced by 15%.

(7 marks)

Or

4. Explain the process to predetermine the efficiency of d.c. motor by using Swinburne's test.

5. (a) Explain the principle and operation of auto transformer. (10 marks)

(b) Draw and explain the no load phasor diagram of a single phase transformer. (5 marks)

Or

6. a) Explain the working of auto transformer and prove that when transformation ratio approaches unity, the amount copper used approaches smaller value.

(10 marks)

b) The emf per turn of a single phase, 6.6kV/440V, 50 Hz transformer is approximately 12V. Calculate the number of turns in the HV and LV windings and the net cross sectional area of the core for a maximum flux density of 1.5T.

(5 marks)

7. Determine the number of poles, armature diameter and core length for the preliminary design of a 500kW, 400V, 600 r.p.m., dc shunt generator assuming an average flux density in the air gap of 0.7 T and specific electric loading of 38400 ampere- conductors per metre. Assume core length/ pole arc = 1.1. Apply suitable checks.

Or

8. a) Draw the construction of three phase transformer core and calculate overall dimensions by indicating main dimensions.

   b) Derive the output equation of single phase and three phase transformer.

(4 × 15 = 60 marks)

C 5358 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Automobile Engineering

AM 14 406—COMPUTER ASSISTED AUTOMOBILE DRAWING

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer the following :

1 Draw a simple layout of a Light Motor Vehicle (LMV) service station showing the details of equipments and specifications.

(1 × 25 = 25 marks)

Part B

II. Answer any *one* question :

2 Explain with neat sketch about the fuel gauge briefly.

3 Explain with neat sketch about the temperature gauge circuits briefly.

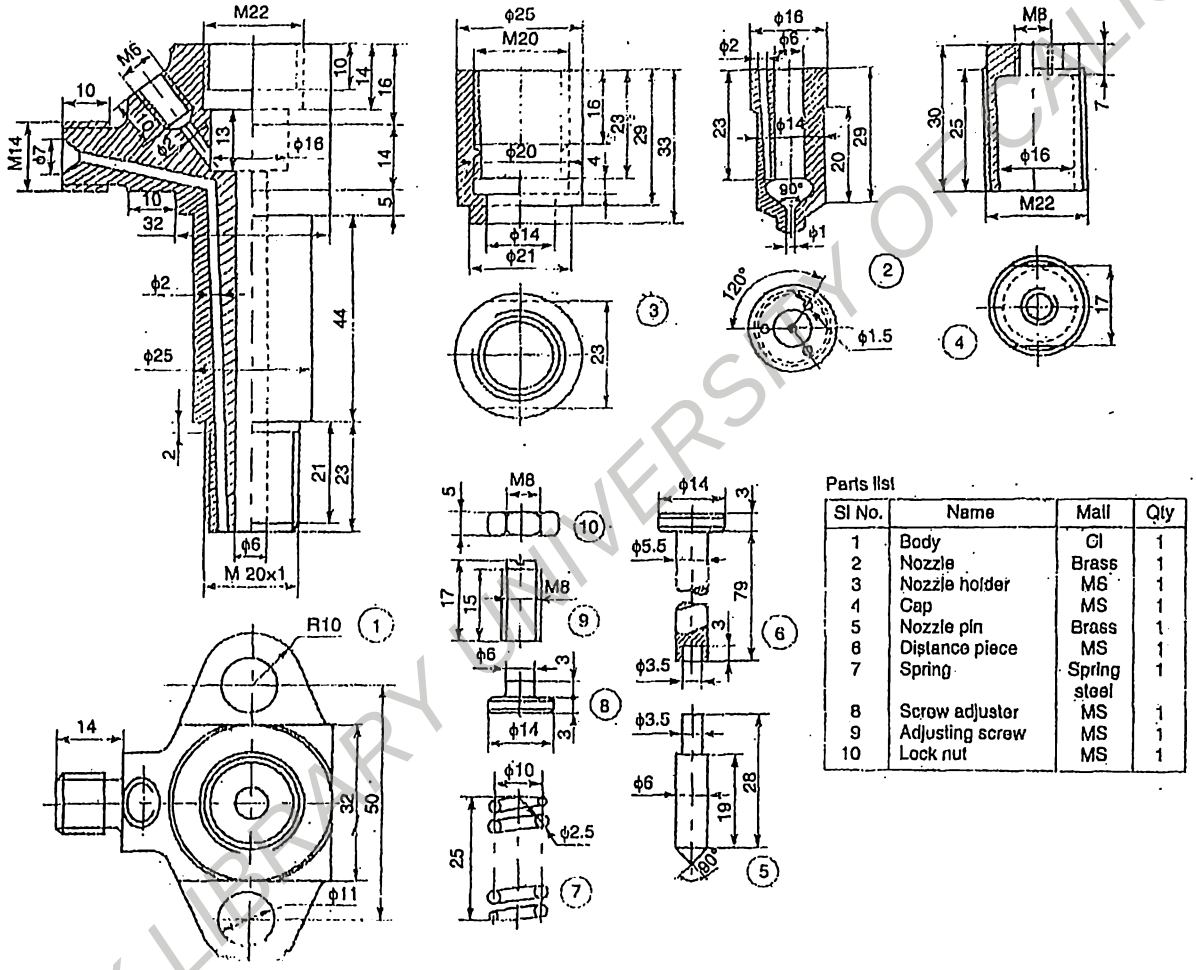
(1 × 30 = 30 marks)

Turn over

Part C

III. Answer any *one* question :

4 Assemble the parts of fuel injector as shown in Fig. 1 and draw (i) half view from the front and (ii) view from above. Use suitable scale.

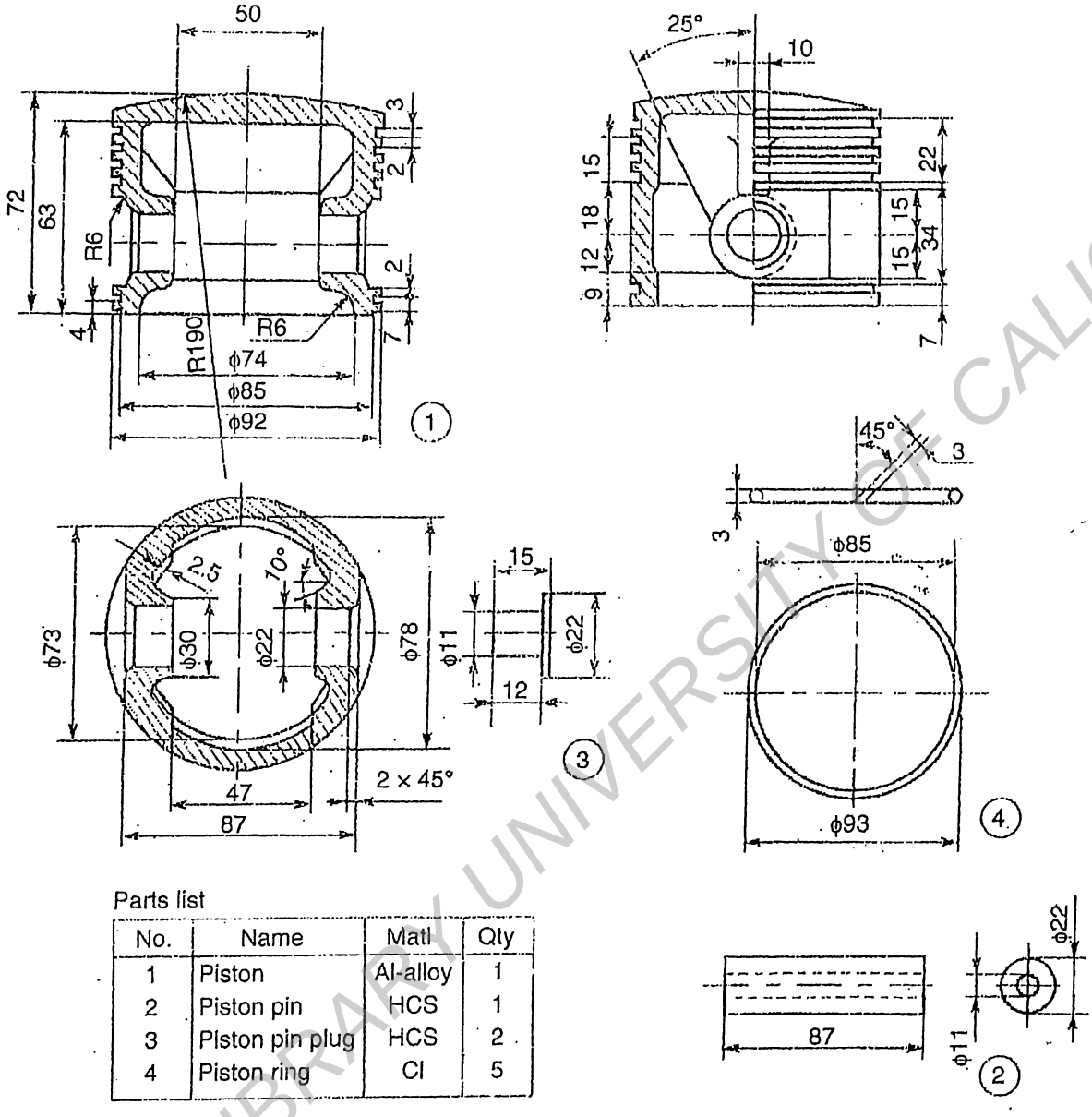


Parts list

Sl No.	Name	Mall	Qty
1	Body	CI	1
2	Nozzle	Brass	1
3	Nozzle holder	MS	1
4	Cap	MS	1
5	Nozzle pin	Brass	1
6	Distance piece	MS	1
7	Spring	Spring steel	1
8	Screw adjuster	MS	1
9	Adjusting screw	MS	1
10	Lock nut	MS	1

Fig 1

5 Assemble the parts of the piston as shown in Fig. 2 and draw (i) sectional view from the front and (ii) half sectional view from the left.



Parts list

No.	Name	Matl	Qty
1	Piston	Al-alloy	1
2	Piston pin	HCS	1
3	Piston pin plug	HCS	2
4	Piston ring	CI	5

Fig 2

(1 × 45 = 45 marks)

C 5357 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Automobile Engineering

AM 14 405—AUTOMOTIVE TRANSMISSION

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of ten :

1 Explain the working of coil-spring clutch with neat sketch.

2 Configure the power flow diagrams of a 4 + 1 constant mesh gear box ?

3 Explain the working of planetary gear set operation.

4 Explain the working principle of fluid fly wheel.

5 What is the function of the reactor in a torque converter ? How does this function ?

6 State the advantages of an automatic transmission over manual transmission. Name any *two* transmission fluids.

7 Differentiate between Chevrolet Turbo glide transmission with Toyota "ECT-I" power glides transmission.

8 Brief about anti drag baffle.

9 Describe the construction and working of an automotive lighting system.

10 Comparison of hydrostatic drive with hydrodynamic drive.

(8 × 5= 40 marks)

Part B

II. Answer *all* questions :

11 Explain the construction and working operation of various clutches used in two-wheelers.

Or

12 State and describe the construction and working of synchromesh gear box with power flow configurations.

Turn over

13 What is meant by Epicyclic gear train ? Explain the construction and working principle of an Epicyclic gear train with neat sketch.

Or

14 Explain the construction and working principle of a Torque convertor with neat sketch. Also, discuss about the performance curve of the torque converter.

15 Explain briefly various control system for automatic transmission.

Or

16 Explain with neat sketch Borg Warner type automatic transmission.

17 Explain the construction and working principle of a Janny hydrostatic drive.

Or

18 With neat circuit diagram explain the automotive hazardous and flashing light systems

(4 × 15 = 60 marks)

C 5356 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Automobile Engineering

AM 14 404—AUTOMOTIVE ENGINES

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of ten :

1 List out the advantages and disadvantages of SI engine over CI engine.

2 Brief about the effects of exhaust emission.

3 Describe the structure of the fuel cell.

4 Briefly explain hydrogen storage using compression and liquefaction.

5 Brief about the Lean burn NOx reducing catalysts.

6 What are the functions of engine management system ? Brief about it.

7 Brief about various control technologies for diesel engine emission.

8 What is the need for electronically controlled EGR ?

9 Explain any *one* of the techniques to overcome the turbo lag.

10 Brief about motors and alternators used in IC Engines.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11 Discuss the various stages of combustion in SI and Cl engine.

Or

12 Detail note on automotive emission norms.

13 Explain in detail about the hydrogen physical and chemical properties along with it's salient characteristics.

Or

14 With neat sketches, explain the principle, construction and working of GDI and MPFI engines.

Turn over

15 With the help of microprocessor how exhaust gas emission is reduced with employing electronic engine management systems.

Or

16 Explain the working of throttle position sensor and oxygen sensor used in automobiles in detail.

17 With neat sketches, explain the principle, construction and working of liquid cooling systems.

Or

18 Explain the different types of gasoline fuel injection systems with neat sketches.

(4 × 15 = 60 marks)

C 5355 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Automobile Engineering

AM 14 403—FLUID MECHANICS AND MACHINERY

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of ten :

1 A glass tube of diameter 3 mm is dipped in water. Find the capillary effect if the surface tension of water in contact with air is 7.35×10^{-2} N/m. Also find the capillary effect if the glass tube is dipped in mercury. The surface tension of mercury in contact with air is 47.5×10^{-2} N/m. The contact angle for water with glass is 0° and mercury with glass is 130°. Find the tube diameters required, if it is decided to limit the capillary effect to 2 mm in water and 1 mm in mercury.

2 Discuss the stability of : (a) A submerged ; and (b) A floating body whose centre of gravity is above the centre of buoyancy.

3 State the Buckingham theorem. Also, List the advantages of dimensional analysis.

4 Water is pumped from a lower reservoir to a higher reservoir by a pump that provides 20 kW of useful mechanical power to the water. The free surface of the upper reservoir is 45 m higher than the surface of the lower reservoir. If the flow rate of water is measured to be 0.03m3/s, determine the irreversible head loss of the system and the lost mechanical power during this process.

5 An oil of specific gravity 0.85 and viscosity 0.05 poise (1 poise = 10^{-1} Ns/m^2) flows through a 20 cm diameter pipe at the rate of 75 liters/s. Find the head loss due to friction for a 500 m length of pipe. Also calculate the power required to maintain this flow.

6 Explain how flow rate is measured with obstruction type flow meters. Compare orifice meters, flow nozzles, and venture meter with respect to size, head loss and accuracy.

7 Show that the force exerted by a jet of water on an inclined fixed plate in the direction of jet is given by : $Fx = \rho A V^2 \sin^2\alpha$, where V is the velocity of jet, A is area of jet and α is the inclination of plate to the direction of jet.

8 Draw the operating characteristic curves for Kaplan and propeller turbines. What inference do you get from these curves ?

Turn over

9 Briefly explain multistage pump.

10 Explain the term negative slip as used in connection with the working of a reciprocating pump. Why and when negative slip occurs ?

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11 Determine the new differential reading along the inclined leg of the mercury manometer of Figure 1, if the pressure in pipe A is decreased 10 kPa and the pressure in pipe B remains unchanged. The fluid in A has a specific gravity of 0.9 and the fluid in B is water.

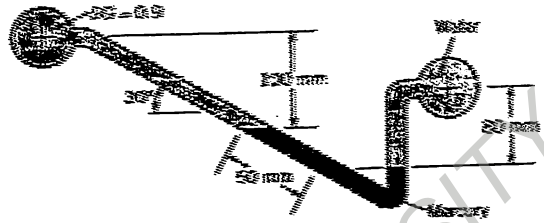


Figure 1.

Or

12 A ship has a length of 150 m and wetted area of 3000 m^2. A model of this ship 5 m in length when towed in fresh water (ρ = 1000 kg/m^3) at 2 m/s produces a resistance of 40 N. Calculate : (i) The corresponding speed of the ship ; (ii) The shaft power required to propel the ship at this speed through water. The resistance (R) to the motion of the ship is given by $R = \rho v^2 L^2 \Phi\left(\rho VL/\mu\right)$.

13 A fan is to be selected to ventilate a bathroom whose dimensions are 2 m × 3 m × 3 m. The air velocity is not to exceed 8 m/s to minimize vibration and noise. The combined efficiency of the fan-motor unit to be used can be taken to be 50 percent. If the fan is to replace the entire volume of air in 10 min, determine : (a) The wattage of the fan-motor unit to be purchased ; (b) The diameter of the fan casing ; and (c) the pressure difference across the fan. Take the air density to be 1.2 kg/m^3 and disregard the effect of the kinetic energy correction factors.

Or

14 Consider the flow of oil with ρ = 894 kg/m^3 and μ = 2.33 kg/m.s in a 40 cm diameter pipeline at an average velocity of 0.5 m/s. A 300 m long section of the pipeline passes through the icy waters of a lake. Disregarding the entrance effects, determine the pumping power required to overcome the pressure losses and to maintain the flow of oil in the pipe.

15 A Pelton wheel with nozzle, for which the co-efficient of velocity is 0.98, is 600 m below the water surface of the lake. The jet diameter is 90 mm, the pipe diameter is 0.65 m, its length is 4.5 km and the co-efficient of friction f = 0.031 in the formula hf = flv^2/2gd. The buckets deflect the jet through 160° and they run at 0.47 jet speed, bucket friction reduces the relative velocity at outlet by 20% of the relative velocity at inlet. If mechanical efficiency of the turbine is 92%, determine the flow rate and shaft horse power developed by the turbine.

Or

16 In an inward flow reaction turbine having a vertical shaft, water enters the runner from the guide blade at an angle of 155° with the runner blade angle at entry being 100°. Both these angles are measured from the tangent at runner periphery drawn in the direction of runner rotation. The flow velocity through the runner is constant, water enters the draft tube from the runner without whirl and the discharge from the draft tube into the tail race takes place with a velocity of 2.5 m/s. The runner has the dimensions of 40 cm external diameter and 3.8 cm inlet width. The turbine works with a net head of 35 m and the loss of head in the turbine due to fluid resistance is 4 m of water. Determine : (i) Speed of the runner ; (ii) Runner blade angle at a point on the outlet edge where the radius of rotation is 9 cm ; (iii) Power generated by the turbine and its specific speed and ; (iv) Inlet diameter of the draft tube.

17 A single stage centrifugal pump discharges 0.45 m^3 of water/minute producing a head of 15 m. A motor drives the pump and the tachometer registers a speed of 1250 r.p.m. At this speed the brake power necessary to drive the pump is 6 kW. If the number of revolutions is increased to 1450 r.p.m., find the new discharge, head and brake power.

Or

18 A single acting reciprocating pump has a stroke length of 15 cm, the suction pipe is 7 m long and the ratio of suction pipe diameter to the plunger diameter is $\frac{3}{4}$. The water level in the pump is 2.5 m below the axis of the pump cylinder and the pipe connecting the sump and pump cylinder is 7.5 cm diameter. If the crank is running at 75 rpm, determine the pressure head of the piston at the beginning, mid and end of the suction stroke. Take friction co-efficient f = 0.1.

(4 × 15 = 60 marks)

C 5354 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 14 406—CASTING AND JOINING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions from Part A.*

Each question carries 5 *marks.*

1. Distinguish between bench moulding and floor moulding
2. List five types of moulding sands used in sand moulding
3. Differentiate between shrinkage and warpage
4. What is meant by a core ? Why it is needed in casting ?
5. Describe the shell moulding process ? Where it is used ?
6. Explain the factors influencing weldability.
7. Explain the selection of "polarity" in arc welding.
8. Describe any three types of welding defects and their effect on the quality of weld.
9. Describe the soldering process. What are the limitations of it ?
10. Illustrate the process of diffusion bonding.

(8 × 5 = 40 marks)

Part B

Answer any **one** *question from each module*

Each question carries 15 *marks.*

Module I

11. With a neat sketch, explain the working of cupola furnace.
12. Compare and contrast Cupola, Electric resistance and induction furnaces.

MODULE II

13. What is meant by cope, drag and cheek ? Explain the, use of them in casting process.

14. Describe the following processes : (a) Permanent mould casting ; and (b) Die casting.

MODULE III

15. With a sketch, explain the following : (a) Ultrasonic Welding ; and (b) Thermit Welding.

16. With a sketch, explain the features of heat affected zone. List any five welding defects.

MODULE IV

17. List the steps to be followed in soldering. Compare soldering with brazing.

18. Where do you use acrylic and epoxy adhesive bonding processes ? Explain the process of joining ceramic to ceramic parts.

(4 × 15 = 60 marks)

C 5353 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Mechanical Engineering

ME 14 405—FLUID MACHINERY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*
Each question carries 5 *marks.*

1. Differentiate between tangential, radial and axial flows with the aid of examples.
2. List the important uses of dimensional analysis.
3. What do you mean by kinematic similitude ?
4. Describe the working of Pelton turbine, with the aid of a sketch.
5. What is the purpose of guide blades ?
6. Define specific speed of a pump. What is the use of it ?
7. Explain the working of a rotodynamic pump.
8. What is the purpose of priming in a reciprocating pump ?
9. How do you select hydraulic turbines ?
10. Distinguish between centrifugal and reciprocating pumps.

(8 × 5 = 40 marks)

Part B

Answer any **one** *question from each module.*

Module I

11. The equation for specific speed of a turbine is given by $N_S = \left(N\sqrt{P}\right)/H^{3/4}$ By Buckingham pi theorem, and using variables such as power P, Speed N, head H, diameter D of the turbine, density ρ, and acceleration due to gravity *g*, deduce the above expression for N_S.

Turn over

12. What is meant by a water wheel ? Derive an expression for the efficiency of the impact of a jet - impinge on a series of moving blades. Assume suitable symbols such as velocity - v, nozzle diameter d etc.

(15 marks)

Module II

13. A turbine develops 10,000 hp under a head of 25 meter at 140 r.p.m. What is the specific speed ? What would be its normal speed and output under a head of 18 meter ?

14. Write short notes on the following : a) Run away speed ; b) Draft tube ; and c) Braking jet.

(15 marks)

Module III

15. Describe the component parts of a centrifugal pump. List any *three* advantages and limitations of centrifugal pump.

16. Determine the number of impeller stages required for a multi stage pump to lift 4250 liters per minute against a total head of 194 meter at a speed of 760 r.p.m. The specific speed is not to exceed 700.

(15 marks)

Module IV

17. With neat sketches explain : a) Priming of centrifugal pump ; b) Double acting reciprocating pump ; and c) Hydraulic lift

18. Water is to be pumped out of a deep well under a total head of 95 meter. A number of identical pumps of design speed 1000 r.p.m. and specific speed 900 r.p.m., with a rated capacity of 150 liters per minute are available. How many pumps will be needed and how should they be connected ?

(15 marks)

[4 × 15 = 60 marks]

C 5352 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 14 404—ADVANCED MECHANICS OF SOLIDS

Time : Three Hours Maximum : 100 Marks

Part A

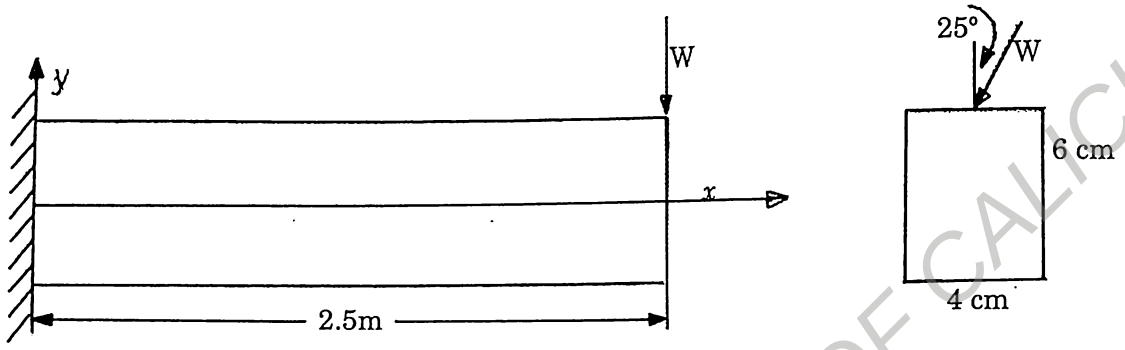
Answer any **eight** *questions.*

1. Explain stress at a point in rectangular shaped member.
2. Describe the relation among elastic constant.
3. Explain the saint venant's principle for end effects.
4. Illustrate the Lame's problem.
5. Derive the relation for Maxwell reciprocal theorem.
6. Explain the strain energy of deformations.
7. Describe the concept from complementary strain energy
8. Find the expression for the maximum shear stress induced in an elliptical bar under torsion?
9. Explain the solution for circular cross-sections.
10. Explain the Saint Venant's theory.

(8 × 5 = 40 marks)

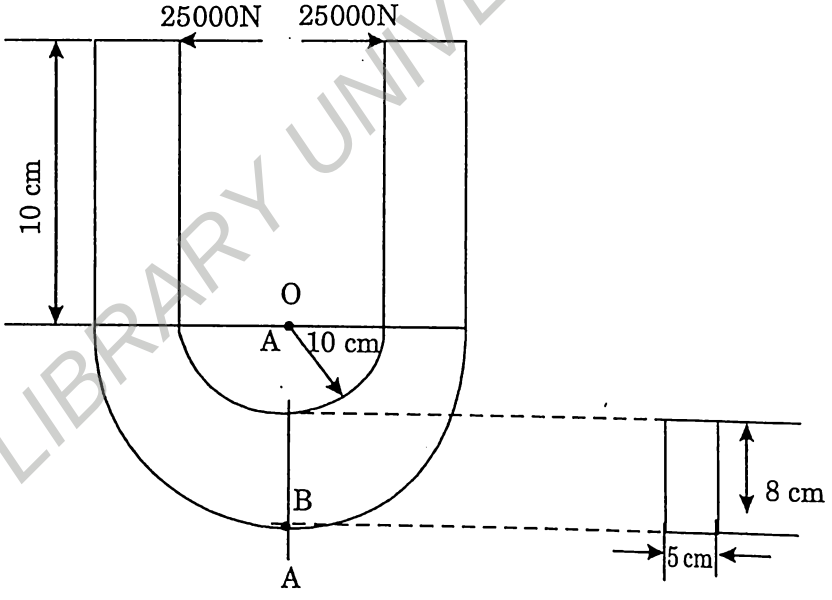
Part B (Descriptive Questions)

1. a) A cantilever of rectangular cross section of breadth 4 cm and depth 6 cm is subjected to an inclined load W at free end as shown in figure. The length of cantilever is 2.5 m and the angle of inclination of the load with vertical is 25°. What is maximum value of W if the maximum stress due to bending is not to exceed 200N/mm^2.



Or

b) Determine the maximum stress in the section A-A as shown in figure. Also mark the region in section A-A where the absolute value of stress is more than 8000 N/cm^2.

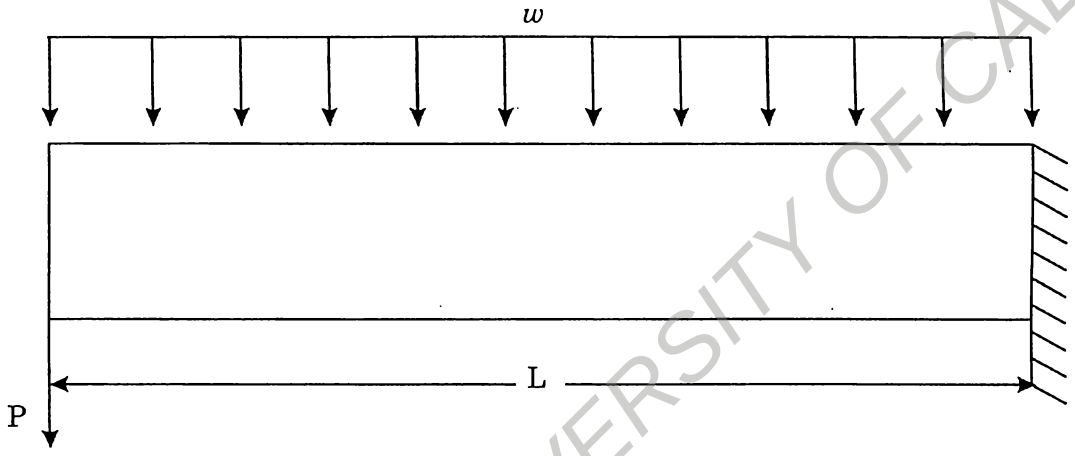


2. a) A cantilever beam supports a uniformly distributed load of *'w'* per unit length and a concentrated load 'P' at the free end in downward direction .Take the length as 'L'. Determine the downward deflection at free end.

Or

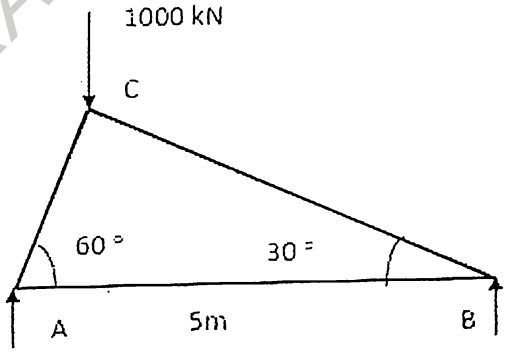
b) A hollow aluminium section having rectangular cross section. The thickness of the section is 6 mm. Outer sides of the section having width 100 mm and height 56 mm. Find the twisting moment taken by the section and angle of twist. Modulus of rigidity is given by 28 GPa .The maximum shear stress induced is 35 N /mm^2.

3. a) The cantilever beam supports a uniformly distributed load w and a concentrated load p as shown in figure. Also it is given that L = 2m, w = 4kN/m, p = 6kN an DEI = 5MN.m^2. Determine the deflection at the free end using Castigliano's theorem.



Or

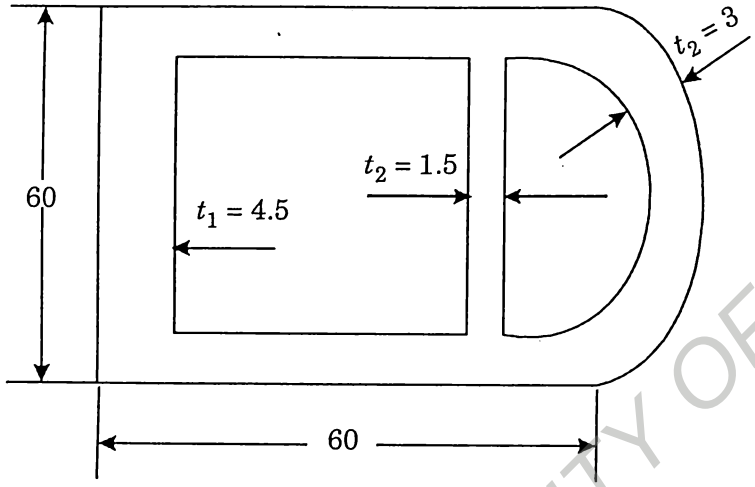
b) Find the downward displacement at the point of load applied for the given figure. Cross section of members 2 cm and Young's modulus 200 GPa.



4. a) Why closed sections are having better tensional rigidity than open section, briefly explain.

Or

b) A hollow thin wall torsion member has two compartments with cross sectional dimensions as given in figure. The material is an aluminium alloy having G = 26GPa. Determine the torque if the maximum shear stress is 40MPa.



C 5351 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 14 403—THERMODYNAMICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions out of ten.*

1. Explain the macroscopic and microscopic approach used in thermodynamics.
2. A heat engine receives 800 kJ of heat from the reservoir at 1000 K and rejects 400 kJ at 400 K. If the surrounding is at 300 K, calculate the first and second law efficiency of the heat engine.
3. Justify why Carnot cycle is not a practical cycle.
4. A heat pump operates on a Carnot heat pump cycle with a COP of 8.7. It keeps a space at 24 °C by consuming 2.15 kW of power. Determine the temperature of the reservoir from which the heat is absorbed and the heating load provided by the heat pump.
5. A heat engine receives heat from a source at 1200 K at a rate of 500 kJ/kg and rejects the waste heat to a medium at 300 K. The work output of the heat engine is 180 kJ/kg. Determine the reversible work and the irreversibility for this process.
6. A 0.08m^3 vessel contains 5 kg of water at a pressure of 60 kPa. Determine : (a) The saturation temperature ; (b) The quality ; and (c) The enthalpy at the vapour phase.
7. One kg of CO_2 has a volume of 1.5m^3 at 150°C. Compute the pressure by Van der Waals equation. The Van der Waals constants a = 362850 $Nm^4/kg\text{-}mol^2$ and b = 0.0423 m^3 /kg-mol.
8. Show that $C_p = \frac{\gamma R}{\gamma - 1}$ for an ideal gas.
9. 1 kmol of octane (C_8H_{18}) is burned with air that contains 10 kmol of O_2. Assuming the products contain only CO_2, H_2O, O_2, and N_2, determine the mole number of each gas in the products and the air-fuel ratio for this combustion process.
10. Explain the adiabatic flame temperature with the help of steady flow energy equation.

(8 × 5 = 40 marks)

Turn over

Part B

11. A gas undergoes a thermodynamic cycle consisting of the processes :

    (i) Process 1 -2 : Constant pressure P_1 = 1.5 bar, V_1 = 0.03 m^3, W_{12} =11.5 kJ

    (ii) Process 2-3 : Compression with PV = constant, $U_3 = U_2$.

    (iii) Process 3-1 : Constant volume, $U_1 - U_3 = -24.8$ kJ.

    There are no significant changes in KE and PE. Determine for the following :

    1 Sketch the cycle on a P-V diagram.

    2 Calculate the network for the cycle in kJ.

    3 Calculate the heat transfer for process 1-2 in kJ.

    4 Show that, $Q_{net, cycle} = W_{net, cycle}$.

Or

12. A turbine operating under stead flow conditions receives steam at the following state : Pressure 15.8 bar ; Specific volume 0.158 m^3/kg ; internal energy 2610 kJ/kg ; velocity 40 m/s. The state of the steam leaving the turbine is : pressure 0.38 bar ; specific volume 4.41 m^3/kg ; internal energy 2360 kJ/kg ; velocity 95 m/s. Heat is lost to the surroundings at the rate of 0.3 kJ/s. if the rate of steam flow is 0.4 kg/s, what is the power developed by the turbine ?

13. A heat pump supplies heat energy to a house at the rate of 180 kJ/hr when the house is maintained at 27°C. Over a period of one month, the heat pump operates for 120 hours to transfer energy from a heat source outside the house to inside the house. Consider a heat pump receiving heat from two different outside energy sources. In one application the heat pump receives heat from the outside air at 2°C. In a second application the heat pump receives heat from a lake having a water temperature of 15°C. if electricity costs Rs.8/kWh, determine the maximum money saved by using the lake water rather than the outside air as the outside energy source.

Or

14. a) A 500-kg steel block is initially at 210°C and is allowed to cool to 27°C by transferring heat to the surrounding air at 27°C. Determine the reversible work and the irreversibility for this process. (Take specific heat of steel = 0.45 kJ/kgK).

(10 marks)

b) Briefly explain Gibb's function and Helmholtz function. (5 marks)

15. A large insulated vessel is divided into two chambers, one containing 3 kg of dry saturated steam at 0.2 MPa and the other 8 kg of steam, 0.7 quality at 0.5 MPa. If the partition between the chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality and entropy change in the process.

Or

16. Derive Maxwell's equations and write down the first and second TdS equations.

17. Explain the heat of combustion for a closed system and open system.

Or

18. Liquid octane (C_8H_{18}) enters the combustion chamber of a gas turbine steadily at 1 atm and 25°C, and it is burned with air that enters the combustion chamber at the same state. Determine the adiabatic flame temperature for : (a) Complete combustion with 100 percent theoretical air ; (b) Complete combustion with 400 percent theoretical air ; and (c) Incomplete combustion (some CO in the products) with 90 percent theoretical air.

(4 × 15 = 60 marks)

C 5349 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Aeronautical Engineering

AN 14 404—THERMODYNAMICS AND THERMAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Answer any **eight** *questions.*

I. 1 Explain Quasi static process in detail.

2 Discuss the PdV work and distinguish between point and path functions

3 Derive steady flow energy equation.

4 Explain Clausius inequality.

5 Explain Carnot cycle.

6 Explain Maxwell's relation.

7 Explain the properties of pure substances and Explain the PT, TS and TV diagrams.

8 Explain about flue gas analysis.

9 Write down the applications of first law of thermodynamics to chemically reacting systems.

10 Explain with examples of heat conduction with heat generation.

(8 × 5 = 40 marks)

Answer **all** *questions.*

II. 11 A fluid undergoes a reversible adiabatic compression from 0.5 Mpa, 0.2 m^3 to 0.05 m^3. According to law PV1.3 = Constant. Determine the change in enthalpy, Internal Energy, Heat transfer and Work transfer during the process.

Or

12 In a steady flow open system a fluid substance flows at the rate of 4kg/s. It enters the system at a pressure of 600kN/m^2, a velocity of 220m/s, Internal energy 2200kJ/kg and a specific volume is 0.42m^3/kg. It leaves the system at the pressure of 150 kN/m^2, a velocity of 145m/s, internal energy 1650kJ/kg and a specific volume of 1.5m^3/kg. During its passage through the system, the substance has a loss by heat transfer of 40kJ/kg to the surroundings. Determine the power of the system, stating whether it is from or to the system. Neglect any change of gravitational potential energy.

Turn over

III. 13 A mass of 9 kg of air at 1.75 bar and 3°C is compressed to 24.5 bar according to the law $pv^{1.32} = C$ and cooled at constant volume to 15°C. Determine

a) Volume and temperature at the end of compression.

b) Change of entropy during compression and during constant volume cooling.

For air take C_p =0.996 kJ/kgK and C_v = 0.712 kJ/kgK.

Or

14 A reversible heat engine operates between two reservoirs at temperatures of 600°C and 40°C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40°C and -20°C. The heat transfer to the engine is 2 MJ and the net output of the combined engine and refrigerator plant is 360 kJ. Find the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40°C. Also find these values if the efficiency of the heat engine and C.O.P of the refrigerator are each 40% of their maximum possible values.

IV. 15 Derive the Clausius clapeyron equation from state postulate.

Or

16 Describe the joule Thompson coefficient for model gases.

V 17 How will you measure the enthalpy change and internal energy for combustion? Explain.

Or

18 Saturated air at 2°C is required to be supplied to a room where the temperature must be held at 20°C with a relative humidity of 50 %. The air is heated and then water at 10°C is sprayed into to give the require humidity. Determine the temperature to which the air must be heated and the mass of spray water required per m^3 of air at room conditions. Assume that the total pressure is constant at 1.013 bar and neglect the fan power.

(4 × 15 = 60 marks)

C 5348 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Aeronautical Engineering

AN 14 403—AIRCRAFT STRUCTURES—I

Time : Three Hours Maximum : 100 Marks

Answer **all** *the questions.*

I. 1 Explain plane truss and plane frames.

2 Discuss about composite beam.

3 Explain the stiffness factor and distribution factor.

4 Compare the Clapeyron's three moment equation and moment distribution model.

5 Derive the strain energy due to load applied gradually.

6 Explain the Maxwell's reciprocal theorem.

7 Explain effective length and give the effective length value of column with various end conditions.

8 Discuss about the Rankine hypothesis formula.

9 Explain St.Venant's theory.

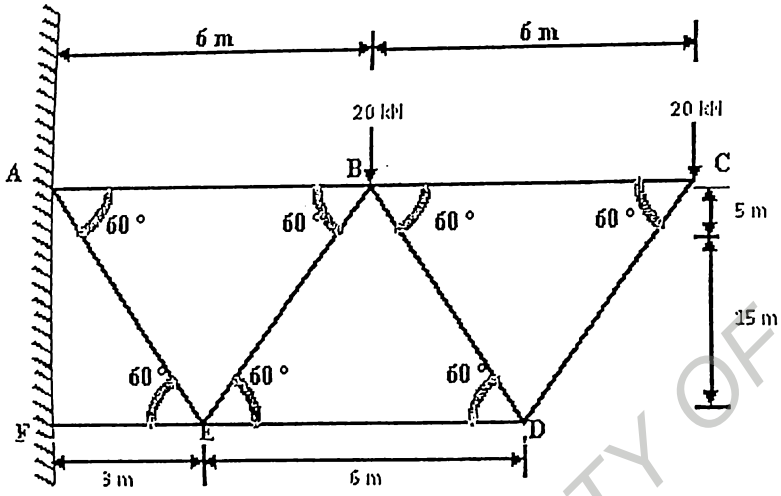
10 Explain maximum strain theory.

(8 × 5 = 40 marks)

II. 11. Derive an expression for Clapeyron's three moment equation and explain the special cases.

Or

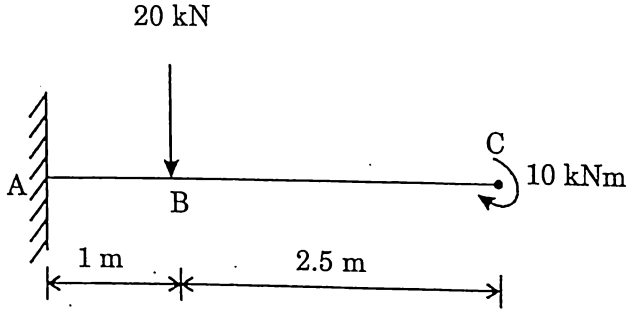
12 A cantilever truss warren type is loaded as shown in figure. Find the forces in all the members of the truss.



III. 13 Explain with an example the use of energy methods in the analysis of statically indeterminate structures.

Or

14 For the beam indicated in Figure 4, obtain the slope and deflection at point B using the unit load method. Use E = 210 GPa and I = 300 × 10^{-6} m^4.



IV. 15 What are the assumptions made while deriving the Euler's formula? And derive the Euler's formula for both ends of the column are pin jointed.

Or

16 Consider a column in which the axial load is applied with an eccentricity with respect to the column axis. With the help of necessary equations, explain the effect of eccentricity on the given column.

V. 17 A steel shaft is subjected to an end thrust producing a stress of 90 MPa and the minimum shearing stress on the surface arising from torsion is 60 MPa. The yield point of the material in simple tension was found to be 300 MPa. Calculate the factor of safety of the shaft according to the following theories :

(i) Maximum shear stress theory.

(ii) Maximum distortion energy theory.

Or

18 Explain :

a) Maximum principle stress theory.

b) Maximum principle strain theory.

(4 × 15 = 60 marks)

C 5347

Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Civil Engineering

CE 14 407 (D)—CIVIL ENGINEERING DRAWING—I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **two** *questions.*

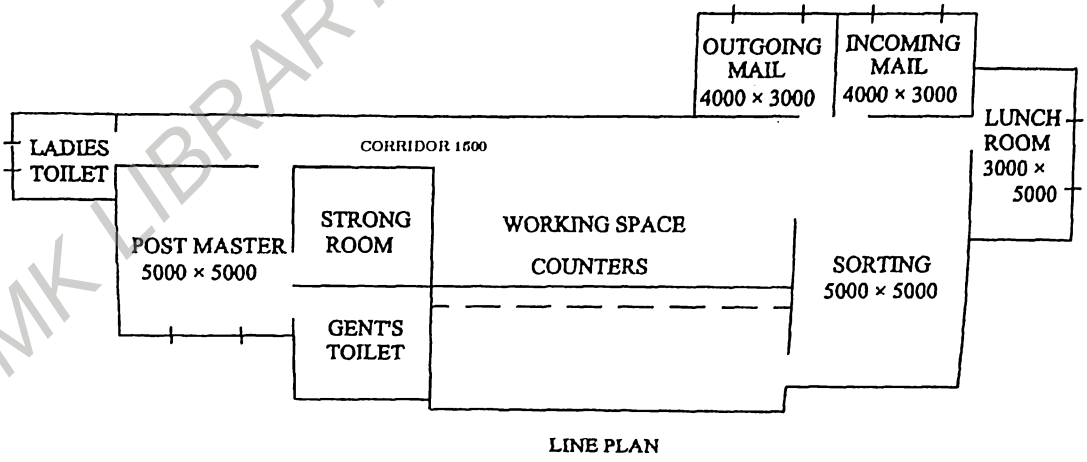
Each question carries 15 *marks.*

1. Draw the front elevation and sectional plan of a Double leaf paneled door with all details. Each leaf divided into two unequal panels. Assume all dimensions as per door requirements.
2. A Staircase is needed to connect two floors separated by 3 m height. Sketch the arrangement of Half turn Stair of a residential building.
3. Draw to a suitable scale, elevation of a King Post Truss, adopted for a span of 6.5 m. Also show the important joint details. Use suitable ISA sections. (2 × 15 = 30 marks)

Part B

Answer the question.

4. Draw the plan, Elevation and section for the line diagram of the post office building shown in fig below. Mention the schedule of the openings :
   (a) Plan of the building ; (30 marks)
   (b) Elevation ; (15 marks)
   (c) Section ; and (15 marks)
   (d) Schedule of the openings. (10 marks)



LINE PLAN

(1 × 70 = 70 marks)

C 5346 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Civil Engineering

CE 14 406—SURVEYING—II

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions out of ten.*

1. Differentiate fixed hair method and movable hair method.
2. Name the essential features of a tacheometer.
3. What is sounding ? List the uses of soundings.
4. Write a note on well-conditioned triangle.
5. Define observed Value of a Quantity and True Value of Quantity.
6. Explain the principles of least squares.
7. Discuss the North, South, East and West Direction in astronomical surveying.
8. Write a short note on : Declination (δ) and Co-declination (p).
9. What is a map ? List the two types of maps.
10. Define GIS. Mention the GIS software's used.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

11. (a) A tacheometric is set up at an intermediate point on a traverse course PQ and the following observations are made on a vertically held staff :

Staff Station	*Vertical Angle*	*Staff Intercept*	*Axial Hair Readings*
P	+8°36'	2.350	2.105
Q	+6°06'	2.055	1.895

The instrument is fitted with an anallactic lens and the constant is 100. Compute the length of PQ and reduced level of Q, that of P being 321.50 m.

Or

Turn over

b) Discuss any two equipments involved in sounding.

12. a) Describe the factors to be considered while selecting base line.

Or

b) An angle A was measured by different persons and the following are the values:

Angle	*Number of measurements*
65° 30' 10"	2
65° 29' 50"	3
65° 30' 00"	3
65° 30' 20"	4
65° 30' 10"	3

Find the most probable value of the angle.

13. a) Explain few points about photogrametric surveying.

Or

b) Find the difference of longitude between two places A and B from their following longitudes.

- Longitude of A = 40° W

  Longitude of B = 73° W
- Longitude of A = 20° E

  Longitude of B = 150° E
- Longitude of A = 20° W

  Longitude of B = 50° W

14. a) Discuss about the raster data and vector data.

Or

b) Describe the different types of maps.

(4 × 15 = 60 marks)

C 5345 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2014 SCHEME] EXAMINATION, APRIL 2021

Civil Engineering

CE 14 405—ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT

Time : Three Hours Maximum : 100 Marks

Section 1

PART A

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Illustrate the social cost of building airport and give the importance of social cost.
2. What is the Law of Demand ? Give its takeaways.
3. What is GDP and how it is calculated ?
4. Interest on a credit card is quoted as 23 % p.a compounded monthly. What is the effective annual interest rate ? Give your answer correct to two decimal places.
5. Why is NPV analysis used ?

(4 × 5 = 20 marks)

PART B

6. (a) Explain in detail on the cost concepts in engineering economics.

Or

(b) (i) Calculate the GNP for Country C in year 3 if candy is produced by foreigners.

(20 × $ 1.50) $ 30.

(5 marks)

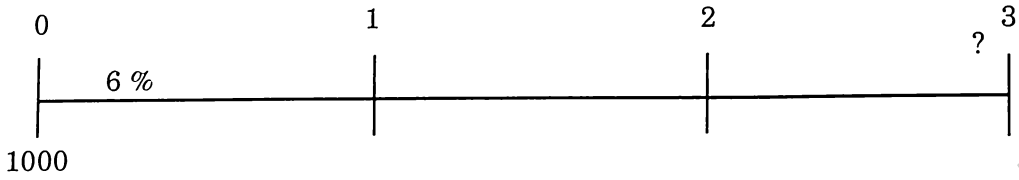
(ii) What is meant by Fiscal Policy in India ? Explain with an example. Also give its main objectives and limitations. How it is different from monetary policy ?

(10 marks)

Turn over

7. (a) (i) Jack deposited $1000 in saving account earning 6 % interest rate. How much will jack money be worth at the end of 3 years ?

Time line



Before solving the problem, List all inputs :

I = 6 % or 0.06

N = 3

PV = 1000

PMT = 0

(4 marks)

(ii) You can buy a security now for $1000 and it will pay you $1,191 three years from now. What annual rate of return are you earning ?

(4 marks)

(iii) Your friend deposits $100,000 into an account paying 8 % per year. She wants to know how long it will take before the interest makes her a millionaire.

(7 marks)

Or

(b) Explain in detail on the problems of cost benefit analysis.

(2 × 15 = 30 marks)

Section 2

PART A

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Explain in brief on the required skills to perform operations management.
2. List and explain in brief on job evaluation methods.
3. What is Element of Cost in Management Accounting ?

4. Explain in brief on the classification of general ledger.

5. Explain in brief on CPM.

(4 × 5 = 20 marks)

PART B

6. (a) Explain in brief on decision making under uncertainty with examples.

Or

(b) Explain in detail on the objectives and procedure of job evaluation.

7. (a) Suriyat & Co Ltd requires a statement showing the result of its production, operation for Sep. 2002. Cost records give the following information as shown in table. 1

Table. 1

	1.9.2002$	30.9.2002$
Raw Materials	1,00,000	1,23,500
Finished Goods	71,500	42,000
Work in Progress	31,000	34,500

Transactions during the month of Sep. 2002 :

Purchase of Raw Materials Direct Wages Works'	$88,00070,000
Expenses	39,500
Administration Expenses	13,000
Sale of Factory Scrap	2,000
Selling and Distribution Expenses	15,000
Sales	2,84,000

Or

(b) List the steps are required for using CPM and PERT for planning and scheduling. Also illustrate the advantages and limitations of PERT.

(2 × 15 = 30 marks)

C 5344 (Pages : 6) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Civil Engineering

CE 14 404—STRUCTURAL ANALYSIS—I

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions out of ten :

1 State the comparison of Castigliano's first theorem and unit load method.

2 Verify Maxwell-Betti law of reciprocal displacement for the direction 1 and 2 of the pin-jointed structure shown in Figure 1.

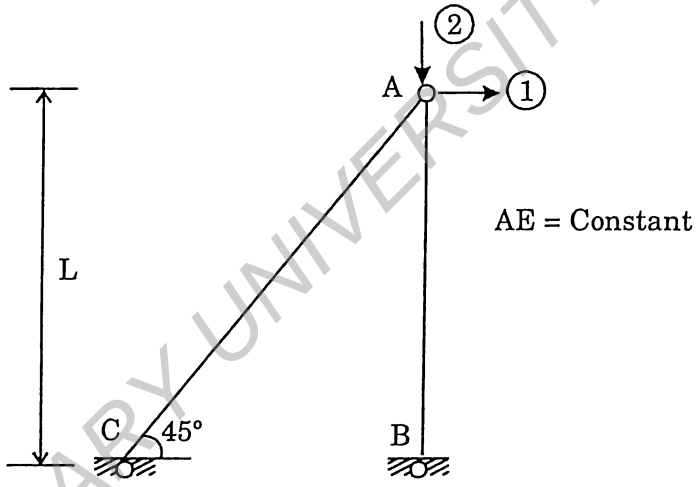


Figure 1

Turn over

3 If the top chord member BC of the truss shown in Figure 2 is heated by a temperature rise of 40°C, find the member forces caused in the truss. Take coefficient of linear expansion of the material, $\alpha = 0.000012/°C$ and modulus of elasticity of the material, $E = 200\ kN/mm^2$.

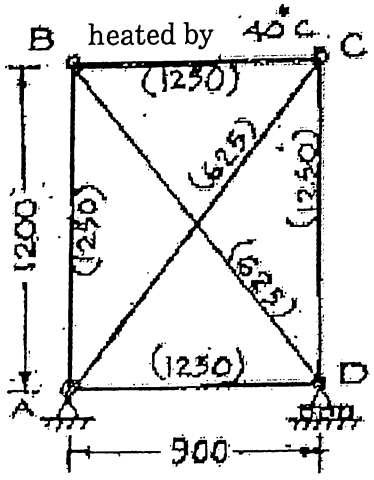


Figure 2

4 Determine the number of indeterminacy for the shown three frames shown in Figure 3.

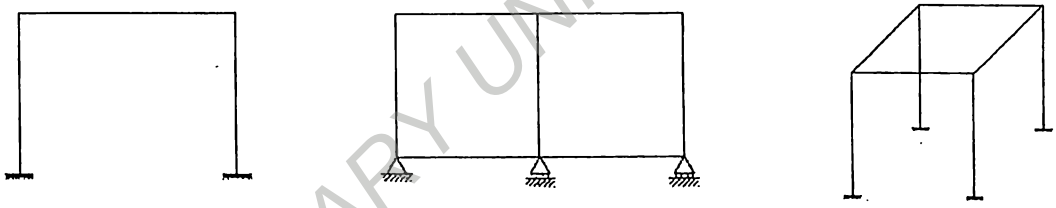


Figure 3

5 Differentiate the statically determinate structures and statically indeterminate structures.

6 State Muller-Breslau principle.

7 Find the equivalent u.d.l. corresponding to :

(i) Single moving load of 80kN crossing a grider of 10 m span.

(ii) Uniform load of 20 kN, 5 m long crossing a grider of 25 m span.

8 A simply supported beam of span 10 m carries a u.d.l. of 20 kN/m over its central 4 m length. With the help of influence line diagram, find the shear force at 3 m from the left support.

9 Differentiate two hinged and three hinged arches.

10 A 3 hinged arch of span 40 m and rise 8 m carries concentrated loads of 200 KN and 150 KN at a distances of 8 m and 16 m from the left end and an U.D.L. of 50 KN/m on the right half of the span.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11 Find the horizontal displacement at joint B of the frame ABCD as shown in Figure 4 by unit load method. Assume EI to be constant for all members.

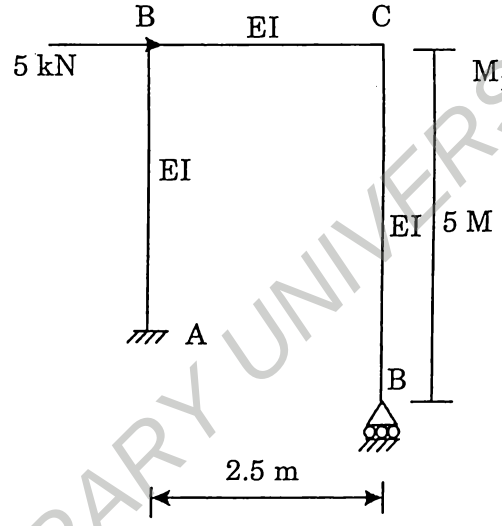


Figure 4

Or

12 Find horizontal and vertical deflection of joint C of truss ABCD loaded as shown in Figure 5. Assume that, all members have the same axial rigidity.

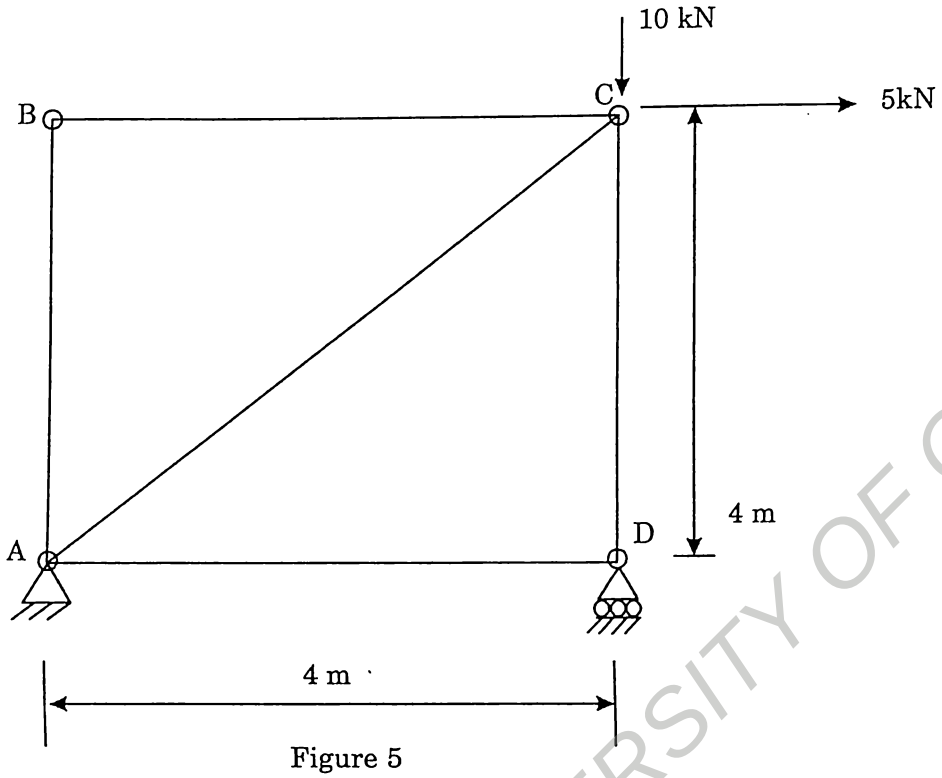


Figure 5

13 Find the forces in the members of the pin-jointed truss shown in Figure 6 subjected to a horizontal load of 40 kN acting at the joint A. The cross-sectional area of the members BC, CD and AC is 3000 mm^2, of AB it is 4000 mm^2 and of AD it is 6000 mm^2. E is same for all the members.

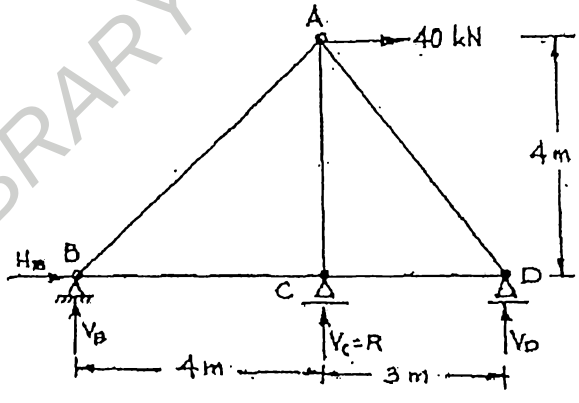


Figure 6

Or

14 Find out the internal forces in members FH, GH and GI (Refer Figure 7) :

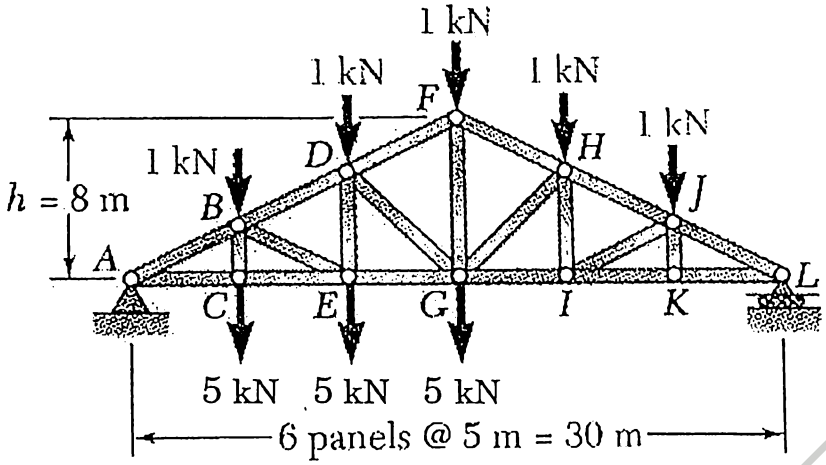


Figure 7

15 Draw influence line for shearing force at 4 m from the propped end of a propped cantilever of span 7 m. Calculate the ordinates at every 1 m.

Or

16 Draw the IL for force in member BC and CI for the truss shown in Figure 8. The height of the truss in 9 m and each segment is 9 m long.

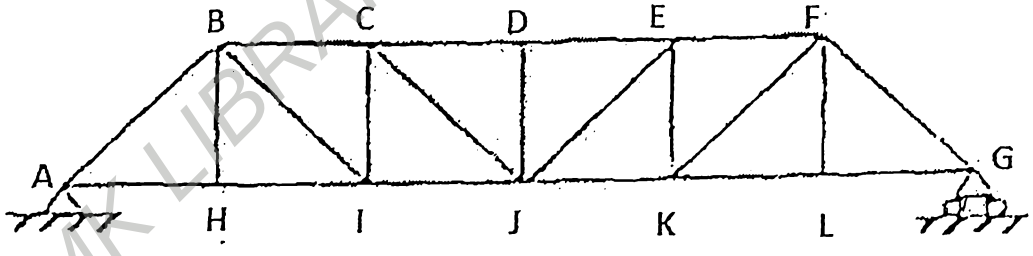


Figure 8

17 Figure 9 shows a three-hinged symmetrical parabolic arch of span 100 m and central rise of 25 m. It is required to find the support reactions due to the loading shown. The left half of the span carries a uniformly distributed load of 2 kN/m while two concentrated loads of 50 kN and 100 kN act at 30 m and 10 m from right hand support as shown.

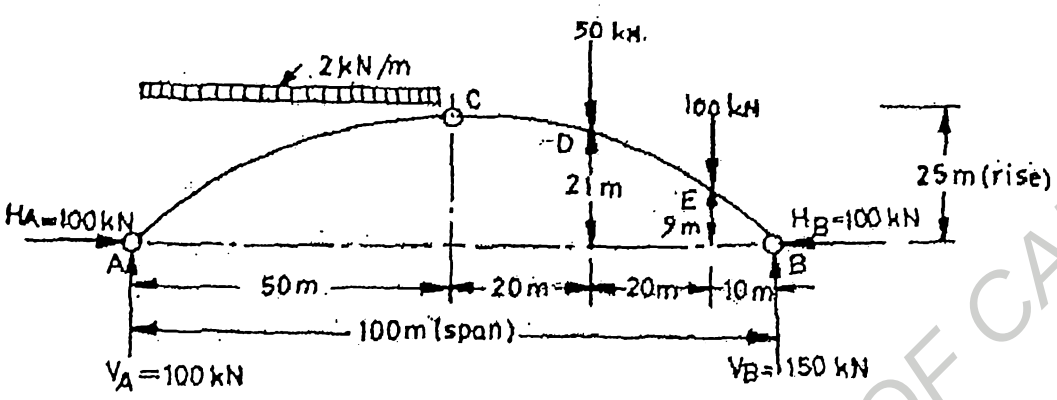


Figure 9

Or

18 A three hinged circular arch of span 16 m and rise 4 m is subjected to two point loads of 100 kN and 80 kN at the left and right quarter span points respectively. Find the reactions at supports. Find also the bending moment, radial shear and normal thrust at 6 m from left support.

(4 × 15 = 60 marks)

C 5343 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

Civil Engineering

CE 14 403—FLUID MECHANICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

1. Define Compressibility.
2. Two horizontalplates are placed 1.25 cm apart. The space between them being filled with oil of viscosity14 poises. Calculate the shear stress in oil if upper plate is moved with a velocity of 2.5 m/s.
3. A sub-marine moves horizontally in a sea and has its axis 15 m below the surface of water. A pitot tube properly placed just in front of the sub-marine and along its axis connected to the two limbs of a U - tube containing mercury. The difference of mercury level is found to be 170 mm. find the speed of the sub-marine knowing that the sp.gr. of mercury is 13.6 and that of sea-water is 1.026 with respect fresh water.
4. What are the assumptions made in the derivation of Bernoulli's equation ?
5. Give a few examples laminar flow / viscous flow.
6. What are pipesin series and pipes in parallel ?
7. How are energy losses in pipe classified ?
8. What is laminar sub layer ?
9. List the application of Froude's model laws.
10. Define boundary layer thickness.

(8 × 5 = 40 marks)

Part B

Answer **four** *questions.*

11. If the velocity profile of a fluid over a plate is a parabolic with the vertex 202 cm from the plate, where the velocity is 120 cm/sec. Calculate the velocity gradients and shear stress at a distance of 0,10 and 20 cm from the plate, if the viscosity of the fluid is 8.5 poise.

Or

Turn over

12. A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 Nm is required to rotate the inner cylinder at 100 rpm determine the viscosity of the fluid.

13. In a vertical pipe conveying oil of specific gravity 0.8, two pressure gauges have been installed at A and B where the diameters are 16 cm and 8 cm respectively. A is 2 m above B. the pressure gauge readings have shown that the pressure at B is greater than at A by 0.981 N/cm2. Neglecting all losses, calculate the flow rate. If the gauges at A and B are replaced by tubes filled with the same liquid and connected to a U - tube containing mercury, calculate the difference of level of mercury in the two limbs of the U-tube.

Or

14. Sketch a 'V' notch, give the elementary equations to determine discharge and discuss the advantages of 'V' notch over rectangular notch.

15. A pipe line, 300 mm in diameter and 3200 m long is used to pump up 50 kg per second of oil whose density is 950 kg/m^3 and whose kinematic viscosity is 2.1 stokes. The center of the pipe at upper end is 40m above than at the lower end. The discharge at the upper end is atmospheric. Find the pressure at the lower end and draw the hydraulic gradient and the total energy line.

Or

16. Derive the expression for loss of head due to friction in pipes or Darcy - Weisbach Equation.

17. Using Buckingham's π-theorem, show that the velocity through a circular orifice is given $V = \sqrt{2gH}\phi\left[\frac{D}{H}, \frac{\mu}{\rho VH}\right]$, by where H is the head causing flow, D is the diameter of the orifice, p is co-efficient of viscosity, p is the mass density and g is the acceleration due to gravity.

Or

18. The ratio of lengths of a sub-marine and its model is 30 : 1. The speed of submarine (protope) is 10 m/s. The model is to be tested in a wind tunnel. Find the speed of air in wind tunnel. Also determine the ratio of the drag (resistance) between the model and its protope. Take the value of kinematic viscosities for sea water and air as .012 stokes and .016 stokes respectively. The density for sea-water and air is given as 1030 kg/m^3 and 1.24 kg/m^3 respectively.

(4 × 15 = 60 marks)

C 5341 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2014 SCHEME) EXAMINATION, APRIL 2021

B.Tech.

EN 14 402—ENVIRONMENTAL SCIENCE

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions, each question carries 5 marks.*

1. With suitable example explain renewable and non-renewable source of energy.
2. Discuss the different application of solar energy.
3. Briefly explain the environmental effects of extracting mineral resources.
4. Give the structure of an ecosystem.
5. Discuss the function of forest ecosystem.
6. Briefly explain the conservation of biodiversity.
7. What is soil pollution ? What are its impacts ?
8. What are different sources of air pollutants ?
9. What is ozone layer ? How is it helpful in protecting life on earth ?
10. Give a short account of nuclear hazards.

(8 × 5 = 40 marks)

Part B

11. (a) Discuss in detail the major consequences of deforestation .What are the main factors which contribute to desertification ?

Or

(b) Write an essay on the need of dams and their defects on forests and tribal people.

12. (a) What is an ecosystem ? Describe in detail the various tropic levels of an ecosystem.

Or

(b) What do you mean by balance in nature ? How is balance in nature brought about ? Explain in detail with suitable example.

Turn over

13. (a) What is pollution ? Discuss the various types of pollution.

Or

(b) Discuss the principle of water pollutants. Briefly explain the prevention and control of water pollution.

14. (a) Write an essay on health and environment.

Or

(b) Briefly explain the following :

(i) Global warming.

(ii) Reuse and Recycling of products.

(4 × 15 = 60 marks)

C 5340 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2021

EN 14 401 (B)—ENGINEERING MATHEMATICS—IV

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions. Each question carries 5 marks :

1 Given that $f(x)=\frac{k}{2^x}$ is a probability distribution for a random variable that can take on the values x = 0, 1, 2, 3 and 4, find k. Find also the mean and variance of the distribution.

2 During one stage in the manufacture of integrated circuit chips, a coating must be applied. If 70 % of chips receive a thick enough coating, use binomial distribution to find the probabilities that, among 15 chips :

(i) at least 12 will have thick enough coatings.

(ii) at most 6 will have thick enough coatings.

(iii) exactly 10 will have thick enough coatings.

3 Find the z-transform of $x(n)=\left(\frac{1}{5}\right)^n\ [u(n)-u(n-5)]$.

4 Find the z-transform of the function :

$$f(k)=\begin{cases}3^k, & k<0\\ 2^k, & k\geq 0.\end{cases}$$

5 Prove that $\frac{d}{dx}\left(x^{-n}\mathrm{J}_n(x)\right)=-x^{-n}\mathrm{J}_{n+1}(x)$.

6 Prove that $\mathrm{J}_{1/2}(x)=\sqrt{\frac{2}{\pi x}}\sin x$.

7 Solve the differential equation $\frac{y^2z}{x}p+xzq=y^2$.

8 Solve the differential equation $z = p^2 + q^2$.

9 Classify the PDE $u_{xx}-2u_{xy}+u_{yy}=0$.

10 If X is uniformly distributed on [0, 2]. Find the values of (i) $P(1 \leq X \leq 3/2)$; (ii) $P(|X| \geq 3/2)$; (iii) $P(X \geq 1)$; and (iv) $P(X \leq 3/2)$.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11 (a) In a photographic process, the time to process 8 × 10 prints from a memory card may be looked upon as a random variable having the normal distribution with a mean of 10.28 seconds and a standard deviation of 0.12 second. Find the probability that it will take

(i) anywhere from 10 to 10.50 seconds to process one of the prints.

(ii) atleast 10.20 seconds to process one of the prints.

(iii) atmost 10.35 seconds to process one of the prints.

(8 marks)

(b) Fit a Poisson distributin to the following data :—

x :	0	1	2	3	4	5
f :	142	156	69	27	5	1

(7 marks)

Or

12 (a) In a certain city, the daily consumption of electric power (in millions of Kilowatt-hours) can be treated as a random variable having a gamma distribution with $\alpha = 3$ and $\beta = 2$. If the power plant of this city has a daily capacity of 12 million kilowatt-hours, what is the probability that this power supply will be inadequate on any given day.

(7 marks)

(b) If the probability density of a random variable is given by

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 \leq x < 2 \\ 0 & \text{elsewhere} \end{cases}$$

Find the probabilities that a random variable having this probability density will take on a value :

(i) between 0.2 and 0.8 ; (ii) between 0.6 and 1.6 ; (iii) greater than 1.8 ; (iv) find μ and σ^2 for the distribution.

(8 marks)

13 (a) Find the z-transform of $c^k \cos \alpha k$, $k \geq 0$. (8 marks)

(b) Find the z-transform of $f * g$ where $f(n) = 3^n u(n)$ and $g(n) = 4^n u(n)$ using convolution theorem. (4 marks)

(c) Find the z-transform of $e^{-t} t^2$. (3 marks)

Or

14 (a) Find inverse z-transform of $\frac{10z}{z^2 - 3z + 2}$ by long division method. (7 marks)

(b) Find inverse z-transform of $\frac{z^2 + z}{(z-1)(z^2+1)}$ by residue method. (8 marks)

15 (a) Solve in series the equation $\frac{d^2y}{dx^2} + x^2 y = 0$. (8 marks)

(b) Prove that $xJ_n' = nJ_n - xJ_{n+1}$. (7 marks)

Or

16 Find the solution in generalized series form about $x = 0$ of the differential equation $3x \frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$ by Frobenius method. (15 marks)

17 (a) Derive the one-dimensional heat equation. (7 marks)

(b) Solve the one-dimensional wave equation by the method of separation of variables. (8 marks)

Or

18 Solve the following PDE's :

(i) $z = px + qy + p^2 + q^2$. (ii) $pe^y = qe^x$.

(iii) $\sqrt{p} + \sqrt{q} = 1$. (iv) $p(1+q) = qz$. (15 marks)

[4 × 15 = 60 marks]

FOURTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, APRIL 2021

EN 14 401 (A)—ENGINEERING MATHEMATICS—IV

Time : Three Hours Maximum : 100 Marks

Part A

I. Answer any *eight* questions. Each question carries 5 marks :

1 A discrete random variable X has the probability function :

x	:	1	2	3	4	5	6	7
$f(x)$	:	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

(i) Find k.

(ii) Evaluate P(X < 3), P (X ≥ 6).

(iii) Find mean and variance of the distribution.

2 If the p.d.f. of a continuous random variable X is given by

$$f(x)=\begin{cases} k(1-x^2) & \text{for } 0\le x\le 1 \\ 0 & \text{otherwise.} \end{cases}$$

Find (i) the value of k and (ii) the probability P (.5 ≤ X ≤ 2).

3 500 ball bearings have a mean weight of 142.30 gm. and a standard deviation of 8.50 gm. Find the probability that a random sample of 100 ball bearings chosen from this set will have a combined weight between 14061 gm. and 14175 gm.

4 Let $\overline{X}$ be the mean of a random sample of size 20 from a N (μ, 80) distribution. Given $\bar{x}=80.5$, find a 95 % confidence interval for μ.

5 A lathe is adjusted so that the mean dimension of a certain part is 20 cm. A random sample of 10 of the parts produced a mean of 20.3 cm. and a standard deviation of 0.2 cm. Do the results indicate that the machine is out of adjustment ? Test at 5 % level of significance.

6 Suppose that a sample of 25 items is taken. The sample variance s^2 is to be found to be 0.0384. Can we reject $H_0 : \sigma = 0.01225$ in favour of $H_1 : \sigma > 0.01225$.

7 Prove that $J_{1/2}(x)=\sqrt{\frac{2}{\pi x}}\sin x$.

8 Prove that $\frac{d}{dx}\left(x^n J_n(x)\right)=x^n J_{n-1}(x)$.

9 Classify the PDE $xu_{xx} + u_{yy} = 0$.

10 From partial differential equations from the following equations by eliminating the arbitrary constants $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.

(8 × 5 = 40 marks)

Part B

II. Answer *all* questions :

11 (a) An agricultural co-operative claims that 90 % of the watermelons shipped out are ripe and ready to eat. Find the probabilities that among 20 watermelons shipped out :

(i) all 20 are ripe and ready to eat.

(ii) atleast 18 are ripe and ready to eat.

(iii) almost 15 are ripe and ready to eat.

(7 marks)

(b) In a certain factory manufacturing blades there is a small chance of $\frac{1}{500}$ for any blade to be defective. The blades are supplied in packets of 10. Use the Poisson distribution to calculate the approximate number of packets, in a consignment of 10,000 blades, containing (i) no defective blades ; (ii) one defective blade ; and (iii) almost two defective blades.

(8 marks)

Or

12 (a) The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be (i) less than 65 ; (ii) more than 75 ; (iii) between 65 and 75.

(8 marks)

(b) The weights of certain brand shampoo packets are uniformly distributed between 9.3 grams and 10.35 grams. In a random lot of 100 packets how many packets (i) exceed 10 grams ; (ii) below 10.2 grams ; (iii) between 10 grams and 10.2 grams.

(7 marks)

13 (a) Two independent samples of size 7 and 8 items have the following values :

Sample I	:	10	12	10	14	10	9	8
Sample II	:	9	11	11	13	15	9	12	14

Do the two estimates of means of population differ significantly at 5 % level of significance.

(10 marks)

(b) For the following data, test $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$ at 10 % level of significance $n_1 = n_2 = 8$, $s = 8$, $s_1^2 = 3.89$, $s_2^2 = 4.02$.

(5 marks)

Or

14 (a) Five dice were thrown 192 times and the number of times 2 or 4 or 6 were obtained as follows :

No. of dice showing 2 or 4 or 6 ...	0	1	2	3	4	5
Frequency ...	2	20	48	70	46	6

Test the hypothesis that all the dice are unbiased at 5 % level of significance.

(10 marks)

(b) Test $H_0 : \sigma = 0.50$ against $H_1 : \sigma > 0.50$ given the following data :

$n = 15$, $s = 0.64$, $\alpha = 0.05$.

(5 marks)

15 (a) Solve in series the equation $\frac{d^2y}{dx^2} - y = 0$. (8 marks)

(b) Prove that $\frac{d}{dx}\left(x^{-n}J_n(x)\right) = -x^{-n}J_{n+1}(x)$. (7 marks)

Or

16 Find the solution in series, of the differential equation $2x\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$ using Frobenius method.

(15 marks)

17 (a) Solve the one-dimensional heat equation by the method of separation of variables.

(7 marks)

(b) Derive the one-dimensional wave equation. (8 marks)

Or

18 Solve the PDE :

(i) $(z-y)p + (x-z)q = y - x$. (ii) $z^2\left(p^2 + q^2 + 1\right) = a^2$.

(iii) $(pq - p - q)(z - px - qy) = pq$. (iv) $p^2 - q^2 = x - y$.

(15 marks)

[4 × 15 = 60 marks]

C 5338 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Aeronautical Engineering

AN 09 404—HEAT TRANSFER

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is temperature gradient ?
2. Give some examples of heat transfer in engineering.
3. State Newton's law of cooling.
4. What are the assumptions made during LMTD analysis ?
5. Define Mach number.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. A composite wall consists, of 10 cm thick layer of building brick, k = 0.7 W/mK and 3 cm thick plaster, k = 0.5 W/mK. An insulating material of k = 0.08 W/mK is to be added to reduce the heat transfer through the wall by 40 %. Find its thickness.
7. An aluminium rod (k =204 W/mK) 2 cm in diameter and 20 cm long protrudes from a wall which is maintained at 300°C. The end of the rod is insulated and the surface of the rod is exposed to air at 30°C. The heat transfer co-efficient between the rod's surface and air sis 10 Vl/m^{2}K. Calculate the heat lost by the rod and the temperature of the rod at a distance of 10 cm from the wall.
8. Air at 25°C flows over 1 m × 3 m (3 m long) horizontal plate maintained at 200°C at 10 mls. Calculate the average heat transfer co-efficients for both laminar and turbulent regions. Take Re (critical) = 3.5 × 10^5.

Turn over

9. Calculate the net radiant heat exchange per m^2 are for two large parallel plates at temperatures of 427°C and 27°C respectively $\in$ (hot plate) = 0.9 and $\in$ (cold plate) = 0.6. If a polished aluminium shield is placed, between them, find the percentage reduction in the heat transfer ; $\in$ (shield) = 0.4.

10. Hot exhaust gases which enters a finned tube cross flow heat exchanger at 300°C and leave at 100°c, are used to heat pressurized water at a flow rate of 1 kg/s from 35 to 125°C. The exhaust gas specific heat is approximately 1000 J/kg.K, and the overall heat transfer co-efficient based on the gas side surface area is Uh = 100W/m2K. Determine the required gas side surface area Ah using the NTU method. Take Cp, c at Tc = 80°C is 4197 J/kg.K and Cp, h = 1000 J/kg.K .

11. A 1.75 m dia. Propeller of an aeroplane discharges 350 m^3/s of air at a flight speed of 360 km/h in still air of density 1.225 kg/m^3. Calculate (a) Thrust ; and (b) Propulsive efficiency.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. a) A plane wall 10 cm think generates heat at the rate of 4×10^4 W/m^3 when an electric current is passed through it. The convective heat transfer co-efficient between each face of the wall and the ambient air is 50Wm^2K. Determine, (i) The surface temperature ; and (ii) The maximum temperature in the wall. Assume the ambient air temperature to be 20°C and the thermal conductivity of the wall material to be 15 W/mK. (10 marks)

Or

b) A composite wall is formed of a 2.5 cm copper plate (k = 355 W/m.K), a 3.2 mm layer of asbestos (k = 0.110 W/m.K) and a 5 cm layer of fiber plate (k = 0.049 W/m.K). The wall is subjected to an overall temperature difference of 560°C (560°C on the Cu plate side and 0°C on the fiber plate side). Estimate the heat flux through this composite ~ all and the interface temperature between asbestos and fiber plate. (10 marks)

13. a) Air stream of 30°C moves with a velocity of 0.3 m/s across a 100 W electric bulb at 130°C. If the bulb is approximated by a 0.06 m diameter sphere, estimate the rate and the percentage lost due to convection alone. (10 marks)

Or

b) Air at 400 K and 1 atm pressure flows at a speed of 1.5 m/s over a flat plate of 2 m long. The plate is maintained at a uniform temperature of 300 K. If the plate has a width of 0.5 m, estimate the heat transfer co-efficient and the rate of heat transfer from the air stream to the plate. Also estimate the drag force acting on the plate. (10 marks)

14. a) Two parallel plates of size 1.0 m × 1.0 m spaced 0.5m apart are located in a very large room, the walls of which are maintained at a temperature of 27°C. One plate is maintained at a temperature of 900°C and the other at 400°C. Their emissivities are 0.2 and 0.5 respectively. If the plates exchange heat between themselves and surroundings, find the net heat transfer to each plate and to the room. Consider only the plate surfaces facing each other.

(10 marks)

Or

b) In a double pipe counter flow heat exchanger 10,000 kg/hr of an oil having a specific heat of 2095 J/kg K is cooled from 80°C to 50°C by 8000 Kg/hr of water entering at 25°C. Determine the heat exchanger area for an overall heat transfer co-efficient of 300 W/m^{2}K. Take Cp for water as 4130 J/kg K. (10 marks)

15. a) A theoretical gas turbine receives air at 1 bar and 27°C. The maximum allowable temperature is 727°C. The pressure ratio is 5 to 1. Determine per kg of air the work of compressor, the work of turbine and the net work. Also, determine the thermal efficiency of the cycle. If the mass flow rate of air is 5 kg/s, what is the power output ? (10 marks)

Or

b) i) Explain Aerodynamic Heating with examples. (5 marks)

ii) Write short notes about stabilizing zone or primary zone in combustion chamber.

(5 marks)

[4 × 10 = 40 marks]

C 5334 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Biomedical Engineering

BM 09 403—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Show that if $X_1[n]$ is an odd signal and $X_2[n]$ is an even signal, then $X_1[n]$, $X_2[n]$ is odd.
2. Determine the values of P_∞ and E_∞ for the following signal $x(t) = \sin(t)$.
3. Let $x(n) = \delta[n] + 2\delta[n-1]$ and $h(n) = 2\delta[n+1] + 2\delta[n-1]$. Compute $y(n) = x(n) * h(n)$.
4. Determine the Fourier transform of the signal $X(t) = \sin(2\pi t + \pi/4)$.
5. Find the z transform of the signal $x[n] = -a^n u[-n-1]$.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Let $X(t) = \cos wt$ be a periodic signal with period T. Draw $y(t) = X(t/2)$ and observe whether $y(t)$ is also periodic. If so, find the relationship between the fundamental time periods of the two signals.
2. Identify whether the system represented by the block diagram in Fig. 1 is causal.

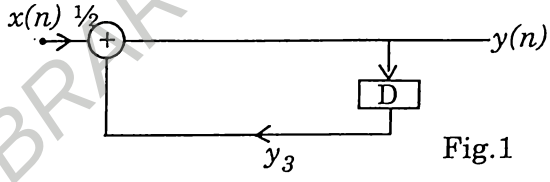


Fig.1

3. Let $X(t)$ be a periodic signal with fundamental period T and Fourier series coefficients a_n. Derive the Fourier series coeffcients of $X(t-t_0) + X(t+t_0)$ in terms of a_n.
4. An LTI system has a frequency response $H(jw) = \dfrac{1}{jw+3}$. For a particular input $x(t)$, this system produces an output $y(t) = e^{-3t}u(t) - e^{-4t}u(t)$, find $X(t)$.

Turn over

5. Consider the signal $x(n) = (1/5)^n u(n-3)$ determine its z transform and the corresponding region of convergence.

6. A CT signal X(t) is sampled using an impulse train. Given that the sampling period used was T = 10^{-4} and also that X(jw) = 0 for $|w| > 500\,\pi$ can the signal X(t) be recovered exactly from its samples using a low-pass filter.

(4 × 5 = 20 marks)

Part C

Answer any **four** *questions.*
Each question carries 10 *marks.*

1. (a) Convolve the signals : X(t) = $e^{-\alpha t}_{u(t)}$ and $h(t) = e^{-\beta t}u(t)$. Do this both when $\alpha \neq \beta$ and when $\alpha = \beta$.

(10 marks)

Or

(b) (i) Consider a causal LTI system implemented as an RLC circuit as seen in Fig. 2. Find the differential equation relating $x(t)$ and $y(t)$.

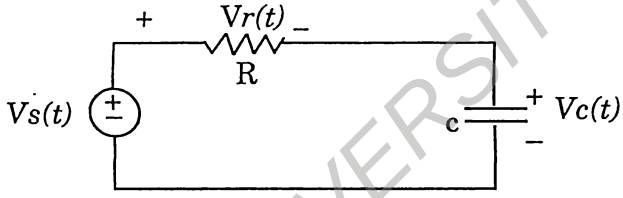


Fig.2

(5 marks)

(ii) Suppose we are given the following facts about a sequence $x(n)$. Find $x(n)$

1 X[n] is periodic with N = 6.

2 $\sum_{n=0}^{5} X[n] = 2.$

(5 marks)

2. (a) Consider the signal in Fig. 3. Express the signal as a sum of linear combination of two rectangular pulse signals and hence find its Fourier transform :

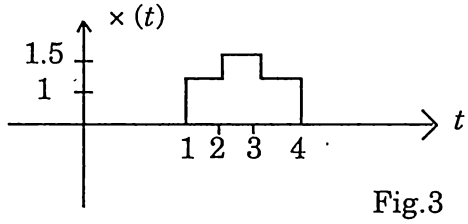


Fig.3

(10 marks)

Or

(b) Consider a stable LTI system characterised by the differential equation

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t).$$

Find the output of the system when the input $x(t) = e^{-t}u(t)$.

3. (a) Find the frequency response of the system :

$$\frac{d^2y(t)}{dt^2} + 10\frac{dy(t)}{dt} + 4y(t) = x(t)$$

where $x(t) = \cos 2\pi t$.

Or

(b) Explain how discrete time signals are represented using impulses.

4. (a) Determine z transform for the sequence $x(n) = (1/2)^n \{u(n+4) - u(n+5)\}$. Also indicate whether the Fourier transform of the sequence exists.

Or

(b) State the conditions to be satisfied for a system function of an LTI system to be causal and stable. Check the same for the system function :

$$H(z) = \frac{(z^3 - 2z^2 + z)}{\left(z^2 + \frac{1}{4}z + \frac{1}{8}\right)}.$$

[4 × 10 = 40 marks]

10. Discuss the steady state stability of electrical drives.

11. Write short notes on v/f control of three phase induction motor drives.

(4 × 5 = 20 marks)

Part C

Answer any **one** *questions from each.*
Each question carries 10 *marks.*

12. (a) A hoist consists of D.C series motor, for this application discuss how you going to design the starting system. Also illustrate the torque speed characteristics of the same.

Or

(b) A 4-pole D.C motor is lap-wound with 400 conductors. The pole shoe is 20 cm long and the average flux density over one-pole- pitch is 0.4 T, the armature diameter being 30 cm. determine the torque and gross mechanical power developed when the motor is drawing 25 A and running at 1500 r.p.m.

13. (a) What is the leakage flux in a transformer ? Why is it modeled in a transformer equivalent circuit as an inductor ?

Or

(b) What do you understand by attraction type and repulsion type instruments ? What are the important difference between moving coil and moving iron instruments ?

14. (a) Why does an alternator's voltage drop sharply when it is loaded down with a lagging load ?

Or

(b) Develop an equivalent circuit of three phase slip ring induction motor and obtain the power across air-gap, torque and power output.

15. (a) Illustrate the four quadrant operation of a motor driving a hoist load and also explain the speed torque conventions of multiquadrant operation.

Or

(b) Explain the three types of speed control methods for induction motors.

(4 × 10 = 40 marks)

C 5332 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2020

Automobile Engineering

AM 09 405—MECHANICS OF SOLIDS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

1 What is a statically indeterminate structure ?

2 Sketch the shear stress distribution on a solid circular shaft due to torsion.

3 What is meant by neutral axis of a beam ?

4 What are the uses of a Mohr's circle ?

5 State the assumptions made in Euler's column theory.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6 A short piece of steel pipe is to carry an axial compressive load of 1500 kN with a factor of safety 2 against yielding. If the thickness of the pipe is to be $(1/4)^{th}$ of outside diameter, find the minimum required outside diameter. Yield stress of the steel is 300 MPa.

7 A round bar of steel tapers uniformly from a diameter of 2.5 cm to 3.5 cm in length of 50 cm. If an axial force of 60 kN is applied at each end, determine the elongation of the bar. Take E = 205 kN/mm^2.

8 A cantilever of length 2 m carries a U.D.L. of 3 kN/m run over a length of 1 m from the fixed end. Draw the S.F. diagram and B.M.diagram.

9 Derive an expression for the deflection at the centre of a simply supported beam carrying a point load at the centre by double integration method.

Turn over

10 At a certain point in a strained material, the intensities of stresses are $\sigma_x = -40$ MPa and Gy = $\sigma_y = -80$ MPa. Determine analytically, the normal and shear stresses on a plane whose normal is inclined at 30° to the X-axis. Also, find the principal stresses and maximum shear stress.

11 A solid round bar 60 mm in diameter and 2.5 m long is used as a strut. One end of the strut is fixed, while its other end is hinged. Find the safe compressive load for this strut, using Euler's formula. Assume E = 200 GN/m^2 and factor of safety = 3.

(4 × 5 = 20 marks)

Part C

Answer **all** *the questions*

12. (a) A copper bar 50 mm in diameter is placed within a steel tube 75 mm external diameter and 50 mm internal diameter of exactly the same length. The two pieces are rigidly fixed together by two pins 18 mm in diameter, one at each end passing through the bar and tube. Calculate the stresses induced in the copper bar, steel tube and pins if the temperature of the combination is raised by 50° C. Take Es = 210 kN/mm^2, Ec = 105 kN/mm^2, $\alpha_s = 12 \times 10^{-6}$ per °C and $\alpha = 17 \times 10^{-6}$ per °C.

Or

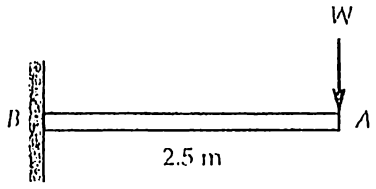
(b) Prove that the volumetric strain of a cylindrical rod subjected to tensile load is equal to the difference of the strain in length and twice the strain in diameter.

13. (a) A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw S.F. and B.M. diagrams and find the point of contrafiexure, if any.

Or

(b) Two shafts of the same material and of same lengths are sub jected to the same torque, if the first shaft is of a solid circular section and the second shaft is of hollow circular section, whose internal diameter is 0.6 times the outside diameter and the maximum shear stress developed in each shaft is the same, compare the weights of the shafts.

14. (a) A beam of T section has a length of 2.5 m and is subjected to a point load as shown in Figure 1. The maximum tensile stress is limited to 300 MPa. Calculate the value of W. Also, calculate the maximum compressive bending stress and plot the stress distribution across the cross section of the beam.



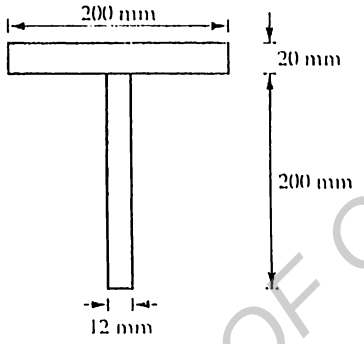


Figure 1

(b) A beam AB, 10 m long, has supports at its ends A and B. It carries two point loads each of magnitude 50 kN, one at 3 m from A and another at 7 m from A. If $E = 2 \times 10^5$ N/mm^2 and $I = 64 \times 10^8$ mm^4, find, using Macaulay's method, the deflection of the beam under the two loads.

15. (a) Direct stresses of 120 N/mm^2 (tensile) and 90 N/mm^2 (compressive) exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm^2.

(i) What must be the magnitude of the shearing stresses on the two planes ?

(ii) What will be the maximum shearing stress at the point ?

Or

(b) Derive an expression for the Euler's crippling load for a long column when one end is fixed and other end is hinged.

(4 × 10 = 40 marks)

C 5331 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Automobile Engineering

AM 09 404—FLUID MACHINERY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*
Each question carries 2 *marks.*

1. State the applications of impulse-momentum equation.
2. What is model analysis ?
3. Give the comparison between impulse and reaction turbines.
4. What is priming ? Why is it necessary ?
5. What is negative slip in reciprocating pump ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Derive an expression for the force exerted by a jet of water on stationary curved plate when jet strikes the plate at the centre.
7. Describe Buckingham's Π-method for dimensional analysis.
8. Explain the design aspects of Pelton wheel.
9. A Kaplan turbine develops 22000 kW at an average head of 35 m. Assuming a speed ratio of 2, flow area of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 88 %, calculate the diameter and speed of the turbine.
10. Derive an expression for the work done by the impeller of a centrifugal pump on liquid.
11. Describe with neat sketch, the working of an air lift pump.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. (a) A jet of water having a velocity of 45 m/s impinges without shock on a series of vanes moving at 15 m/s. The direction of motion of the vanes is inclined at 20° to that of the jet, the relative velocity at outlet is 0.9 of that at inlet, and absolute velocity of water at exit is to be normal to the motion of vanes. Find : (i) Vane angles at inlet and outlet ; (ii) Work done on vanes per newton of water supplied by the jet ; and (iii) Hydraulic efficiency.

Or

(b) A small ship is fitted with jets of total area 0.65 m^2. The velocity through the jet is 9 m/s and speed of the ship is 18 km/h in sea water. The efficiencies of the engine and the pump are 85 % and 65 % respectively. If the water is taken amid-ship, determine : (i) Propelling force ; and (ii) Overall efficiency. Assume the pipe losses to be 10 % of the kinetic energy of the jets.

13. (a) A single jet Pelton wheel runs at 300 r.p.m. under a head of 510 m. The jet diameter is 200 mm, its deflection inside the bucket is 165° and its relative velocity is reduced by 15% due to friction. Determine : (i) Water power ; (ii) Resultant force on the bucket ; and (iii) Overall efficiency. Take C_v = 0.985, speed ratio = 0.46.

Or

(b) An inward flow reaction turbine has an external diameter of 1 m. and its breadth at inlet is 250 mm. If the velocity of flow at inlet is 2 m/s, find weight of water passing through the turbine per second. Assume 10 percent of the area of flow is blocked by blade thickness. If the speed of the runner is 210 r.p.m. and guide blades make an angle of 10° to the wheel tangent, draw the inlet velocity triangle and find : (i) The runner vane angle at inlet ; (ii) The velocity of wheel at inlet ; (iii) The absolute velocity of water leaving the guide vanes ; and (iv) The relative velocity of water entering the runner blade.

C 5331 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Automobile Engineering

AM 09 404—FLUID MACHINERY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*
Each question carries 2 *marks.*

1. State the applications of impulse-momentum equation.
2. What is model analysis ?
3. Give the comparison between impulse and reaction turbines.
4. What is priming ? Why is it necessary ?
5. What is negative slip in reciprocating pump ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Derive an expression for the force exerted by a jet of water on stationary curved plate when jet strikes the plate at the centre.
7. Describe Buckingham's Π-method for dimensional analysis.
8. Explain the design aspects of Pelton wheel.
9. A Kaplan turbine develops 22000 kW at an average head of 35 m. Assuming a speed ratio of 2, flow area of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 88 %, calculate the diameter and speed of the turbine.
10. Derive an expression for the work done by the impeller of a centrifugal pump on liquid.
11. Describe with neat sketch, the working of an air lift pump.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. (a) A jet of water having a velocity of 45 m/s impinges without shock on a series of vanes moving at 15 m/s. The direction of motion of the vanes is inclined at 20° to that of the jet, the relative velocity at outlet is 0.9 of that at inlet, and absolute velocity of water at exit is to be normal to the motion of vanes. Find : (i) Vane angles at inlet and outlet ; (ii) Work done on vanes per newton of water supplied by the jet ; and (iii) Hydraulic efficiency.

Or

(b) A small ship is fitted with jets of total area 0.65 m^2. The velocity through the jet is 9 m/s and speed of the ship is 18 km/h in sea water. The efficiencies of the engine and the pump are 85 % and 65 % respectively. If the water is taken amid-ship, determine : (i) Propelling force ; and (ii) Overall efficiency. Assume the pipe losses to be 10 % of the kinetic energy of the jets.

13. (a) A single jet Pelton wheel runs at 300 r.p.m. under a head of 510 m. The jet diameter is 200 mm, its deflection inside the bucket is 165° and its relative velocity is reduced by 15% due to friction. Determine : (i) Water power ; (ii) Resultant force on the bucket ; and (iii) Overall efficiency. Take C_v = 0.985, speed ratio = 0.46.

Or

(b) An inward flow reaction turbine has an external diameter of 1 m. and its breadth at inlet is 250 mm. If the velocity of flow at inlet is 2 m/s, find weight of water passing through the turbine per second. Assume 10 percent of the area of flow is blocked by blade thickness. If the speed of the runner is 210 r.p.m. and guide blades make an angle of 10° to the wheel tangent, draw the inlet velocity triangle and find : (i) The runner vane angle at inlet ; (ii) The velocity of wheel at inlet ; (iii) The absolute velocity of water leaving the guide vanes ; and (iv) The relative velocity of water entering the runner blade.

14. (a) A centrifugal pump impeller runs at 80 r.p.m. and has outlet vane angle of 60°. The velocity of flow is 2.5 m/s throughout and diameter of the impeller at exit is twice that at inlet. If the manometric head is 20 m. and the manometric efficiency is 75 percent, determine : (i) The diameter of the impeller at the exit ; and (ii) Inlet vane angle.

Or

(b) A three stage centrifugal pump has impellers 400 mm. in diameter and 20 mm. wide at outlet. The vanes are curved back at the outlet at 45° and reduce the circumferential area by 10 %. The manometric efficiency is 90 % and the overall efficiency is 80 %. The pump is running at 1000 r.p.m. and delivering 0.05 m^3/s. Determine : (i) Head generated by the pump ; and (ii) Shaft power required to run the pump.

15. (a) The diameter and stroke length of a single-acting reciprocating pump are 50 mm. and 100 mm. respectively. It takes the supply of water from a sump 4 m. below the pump through a pipe 6 m long and 30 mm. in diameter. It delivers water to a tank 15 m. above the pump through a pipe 40 mm. in diameter and 20 m. long. If separation occurs at 70 kN/m^2 below the atmospheric pressure, find the maximum speed at which pump may be operated without separation. Assume that the piston has a simple harmonic motion.

Or

(b) Explain with neat sketch the construction and working of a screw pump. Also discuss its performance characteristics.

(4 × 10 = 40 marks)

C 5328 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Production Engineering

PE 09 403—THEORY OF MACHINES

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Draw the simple sketch of 'binary link' and 'ternary link'.
2. What is Coriolis acceleration component ?
3. What are "addendum" and "dedendum" of spur gear ?
4. Draw the simple sketch of a flat cam and indicate its nature of working.
5. What are torsional vibrations ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *out of six.*

6. With the aid of examples and sketches, describe any two types of kinematic pairs which are classified according to the nature of relative motion.
7. In a slider-crank mechanism, the crank is 450 mm long and rotates at 22 rad/s in the counter clockwise direction. The length of the connecting rod is 1.1 m. When the crank turns 60° from the inner-dead centre, determine the velocity of the slider.
8. State and describe the law of gearing.
9. Briefly describe the characteristics of cycloidal profile teeth of spur gear.
10. State the advantages and disadvantages of V-belts.
11. A shaft length 0.8 m, supported freely at the ends, is carrying a body of mass 80 kg at 0.3m from one end. Find the natural frequency of transverse vibration. Assume E = 200 GN/m^2 and shaft diameter = 60 mm.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

12. (a) i) With the aid of a sketch, describe the construction and working of double slider-crank chain.

(4 marks)

ii) Describe the first inversion of double slider-crank chain and its application. (6 marks)

Or

(b) Asix-link mechanism is shown in the figure presented below. The dimensions of the links are, OA = 210mm, AB = 475mm, BQ = 300mm, BC = 580mm and CD = 390mm. For the position when the crank OA makes an angle of 60° with the vertical, find the velocity of the slider D. The crank OA rotates clockwise at 160 r.p.m.

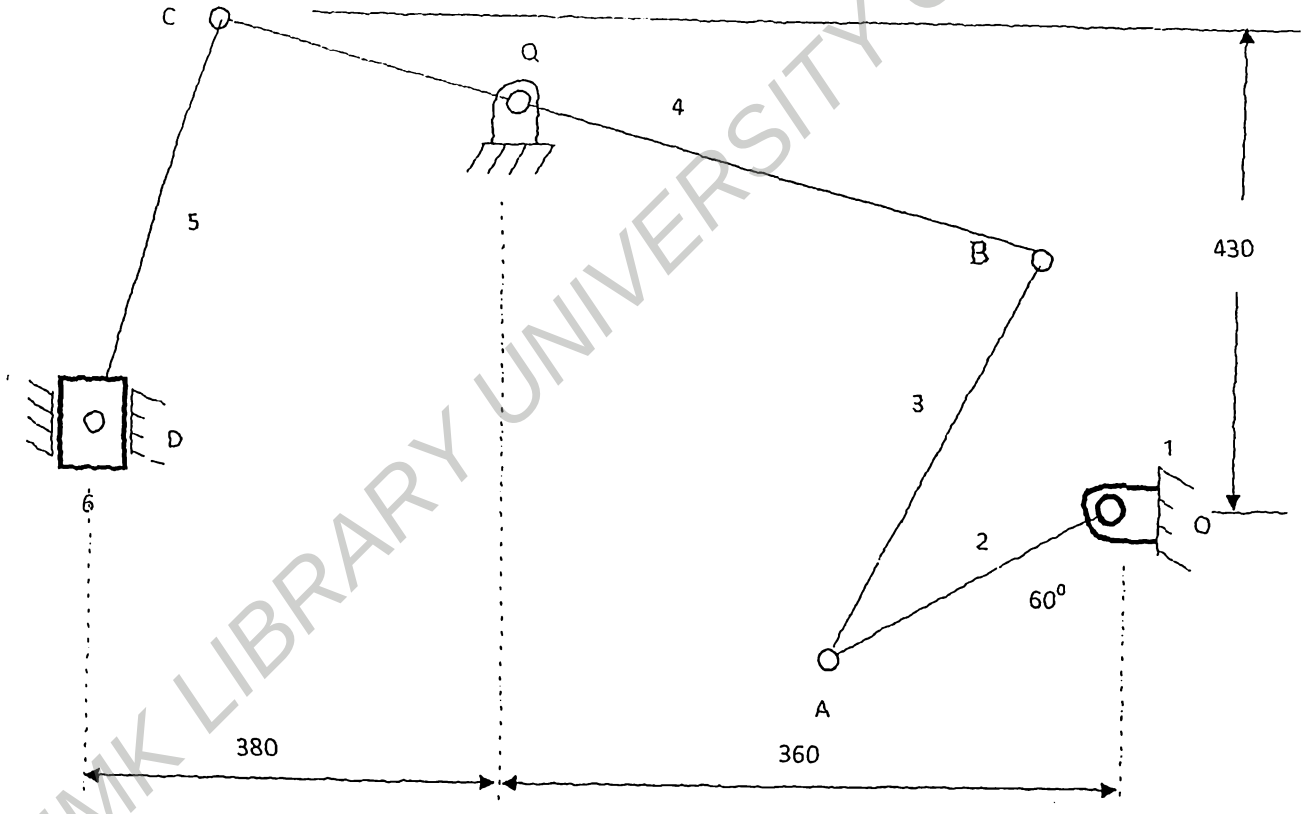


Figure 1.

13. (a) i) A gear train is shown in the Figure 1 presented below. As shown, gears B and C constitute a compound gear. The numbers of teeth are shown along with each wheel in the figure. The numbers of teeth are shown along with each wheel in the figure. Determine the speed and the direction of rotation of wheels A and E. if the arm revolves at 220 rpm clockwise and the gear D is fixed.

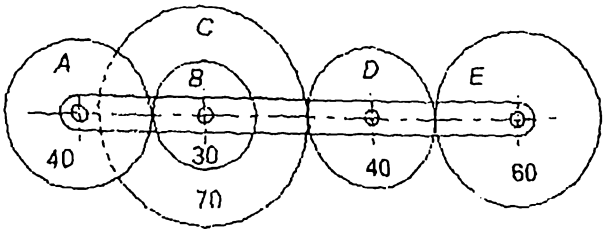


Figure 1

(7 marks)

ii) List the application of compound gears.

(3 marks)

Or

(b) i) An epicyclic gear train is shown in the Figure 2 presented below. The number of teeth on A and B are 100 and 240. Determine the speed of the arm a.

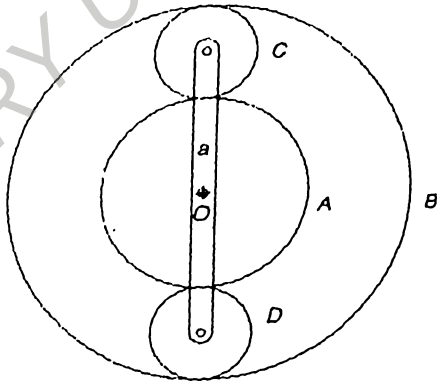


Figure 2.

1 If A rotates at 100 rpm clockwise and B at 50 rpm counterclockwise.

2 If A rotates at 100 rpm clockwise and B is stationary. (7 marks)

ii) List the applications of epicyclic gear train. (3 marks)

14. (a) A cam is to be designed for a knife edge follower with the following data : 1.Cam lift = 30 mm during 90° of cam rotation with simple harmonic motion ; 2. Dwell for the next 30°. 3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. 4. Dwell during the remaining 180°. Draw the profile of the cam when : (a) The line of stroke of the follower passes through the axis of the cam shaft ; and (b) The line of stroke is offset 16 mm from the axis of the cam shaft. The radius of the base circle of the cam is 30 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 220 r.p.m.

(10 marks)

Or

(b) The following data refer to an open belt drive : Diameter of larger pulley = 300mm ;

Diameter of smaller pulley = 200mm : Distance between two pulleys = 1.5 m ; Co-efficient of friction between smaller pulley surface and belt = 0.3 ; maximum tension when the belt is on the point of slipping = 1100 N. Find the power transmitted at a speed of 10m/s. It is desired to increase the power. Which of the following two methods you will select ?

1 Increasing the initial tension in the belt by 10 percent.

2 Increasing the co-efficient of friction between the smaller pulley surface and belt by 10 per cent by the application of suitable dressing on the belt.

Find also, the percentage increase in power possible in each case.

(10 marks)

15. (a) (i) What is meant by critical speed of a shaft ?

(2 marks)

(ii) Following data is given for a rope pulley transmitting 25KW. Diameter of pulley = 360 mm ; Speed = 100r.p.m. ; Angle of groove= 45° ; Angle of lap on smaller pulley= 160° ; Co-efficient of friction = 0.3 ; Number of ropes = 10 ; Mass in kg/m length of ropes = $53C^2$ and working tension is limited to $122C^2$ KN, where C is girth of rope in meters. Find initial tension and diameter of each rope.

(8 marks)

Or

b) A shaft carries four masses A, B, C and D of magnitude 180 kg, 280 kg, 380 kg and 180 kg respectively and revolving at radii 90mm, 80mm,70mm and 90mm in planes measured from A at 300 mm, 400mm and 700mm. The angles between the cranks measured anti-clockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 90 mm, find their magnitudes and angular positions.

[4 × 10 = 40 marks]

C 5327 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation Engineering

AI 09 406—ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is mean by systemic error ?
2. What is Precision ?
3. What is dead time ?
4. What are the advantages of flash ADCs ?
5. What is Transformer ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. What are random error and gross error ? Explain.
7. Define the terms (i) Threshold ; and (ii) Hysteresis.
8. Explain the operation of pulse generator.
9. Differentiate periodic input transient input signals.
10. Differentiate ADC from DAC.
11. Explain the basic principles of sampling oscilloscope.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) With block schematic explain the functional elements of a measuring system.

Or

(b) Explain the least square method of data fitting.

13. (a) With a neat block diagram of a sweep generator and explain its functioning in detail.

Or

(b) Describe the response of first order and second order systems for different inputs.

14. (a) Explain the principle of weighted capacitor DAC. Compare its performance with weighted resistor DAC.

Or

(b) Describe in detail the dual slope method of analog to digital (A/D) conversion.

15. (a) Explain the principle of operation of X-Y recorder with the help of block diagram.

Or

(b) Explain the operation of watt-hour meter.

(4 × 10 = 40 marks)

C 5326 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation Engineering

AI 09 405—ELECTRONIC CIRCUITS—II

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

Each question carries 2 *marks.*

I. 1 What are the important applications of Schmitt trigger circuit ?

2 List out the applications of PLL.

3 List the four basic feedback amplifier topologies.

4 What is crossover distortion ?

5 What are cascaded amplifiers ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

II. 1 What is meant by linear wave shaping ? Give some examples of linear wave shaping circuits.

2 Explain the basic principle PLL.

3 Describe the General features of time base signal.

4 Explain the effect of negative feedback on amplifier characteristics.

5 Explain the classification of power amplifiers.

6 Give a short note on Synchronous tuning.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

III. (1) Sketch the response of RC High pass circuit for exponential input and Ramp input and derive the output equations for the above inputs.

Or

(2) With neat circuit diagram and waveforms, explain the operation of a monostable multivibrator and derive the expression for the pulse width.

(3) Explain briefly about Millerand Bootstrap time base generators.

Or

(4) Draw and explain the A stable operation using IC 555 with suitable circuits

(5) Draw the circuit diagram of voltage shunt feedback amplifier and derive the expressions for voltage gain and feedback factor.

Or

(6) Explain Hartley oscillator and derive the equation for oscillation.

(7) Explain the operation of transformer coupled class A amplifier and show that it has a maximum efficiency of 50 %.

Or

(8) Draw the circuit diagram of class B push pull amplifier and explain its operation. Derive an expression for its maximum conversion efficiency.

(4 × 10 = 40 marks)

C 5325 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation Engineering

AI 09 404—INTRODUCTION TO MICROPROCESSORS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Write down the format of a flat register in 8085.
2. MOV A125
   RRC
   RRC
   STA 1300

   What is the value present in 1300 ?
3. What is the function of BHE and ALE signals ?
4. What is content of control word register to program 8255 in mode 0 and port A as input, port B and C as output port ?
5. What is the purpose of stack in a microprocessor ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Differentiate between microprocessors and microcomputers.
7. Write a subroutine to convert ASCII decimal in 8085.
8. Explain about Assemblers in 8086.
9. Explain the modes of operation of a keyboard in 8279.
10. Explain the cycle straling mode of DMA.
11. Explain about pipelining in 8086.

(4 × 5 = 20 marks)

Part C

12. Describe the various units of a microprocessor.

Or

13. Explain the signals present in 8085.

14. (a) Write a program to move a block of 10 datas from one location to another using 8085.

    (b) Write a program to find the maximum number in a given array of 10 numbers.

(5 + 5 = 10 marks)

Or

15. (a) Write a program to switch on the seven motors one by one with a delay of 1 m. sec.

    (b) Write a program to evaluate the following expression Y = A + B/C – D.

(4 + 6 = 10 marks)

16. Explain the architecture of 8086.

Or

17. Describe the signals present in maximum mode of operation of 8086.

18. Describe the operation of 8259.

Or

19. Explain the different modes of operation of timer.

(4 × 10 = 40 marks)

C 5324 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Applied Electronics and Instrumentation Engineering

AI 09 403—LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

I. 1 State the advantages of MOS over BJT.

2 Define PSRR of an op-amp.

3 Define slew rate of an op-amp.

4 Draw the circuits of an average detector and zero crossing detector.

5 State two advantages of active filter over passive filter.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

II. 1 Explain the photolithographic process of IC fabrication.

2 Explain the block diagrams of an op-amp.

3 Explain the working of I to V converter.

4 Explain the working of an op-amp integrator.

5 Design and explain the working of a first order butterworth high pass filter.

6 Explain the working of a switched capacitor integrator.

(4 × 5 = 20 marks)

Part C

III. 1 Explain the fabrication of BJT.

Or

2 Explain the working of a MOS differential amplifier.

3 Explain the working of a current mirror circuit.

Or

4 Explain the internal circuit of a 741 op-amp.

5 Explain the working of the following circuits :

(a) Instrumentation amplifier.

(b) Differentiator.

Or

6 Explain the working of :

(i) Logarithmic amplifier.

(ii) Timing mark generator.

7 Explain the working of a monostable multivibrator.

Or

8 Design and explain the working of a second order butterworth bandstop filter.

(4 × 10 = 40 marks)

C 5323 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Information Technology Engineering

IT/CS 09 406/PTCS 09 405—MICROPROCESSOR BASED DESIGN

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. What is system BIOS ?
2. State the purpose of segment registers in 8086.
3. Give example for complementing the content of a register.
4. What is the size of the memory that can be interface with a 16-bit address bus ?
5. List the benefits of using an interrupt.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

1. Differentiate serial and parallel interface.
2. Mention the advantages of memory paging.
3. Give examples for direct and register indirect addressing modes.
4. Differentiate between synchronous and asynchronous data transfer.
5. List the feature of ISA bus.
6. Mention the benefits of modular programming.

(4 × 5 = 20 marks)

Part C

1. a) Explain the drive controllers used for floppy and hard disk drives.

Or

b) Discuss the features of 80386, 80486 and Pentium processor.

Turn over

2. a) Describe the real and protected mode memory addressing.

Or

b) Explain program control instructions with examples.

3. a) Explain the differences between two different methods of interfacing I/O to the microprocessor.

Or

b) Draw a block diagram to interface 16550 UART interface and explain the significance of each signal.

4. a) Draw the block diagram to interface a 8259 programmable interrupt controller and explain its modes of operation.

Or

b) Explain the procedure for processing the interrupt.

(4 × 10 = 40 marks)

C 5322 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Information Technology Engineering

IT09405—DATA MODELLING AND DESIGN

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is an object ? Give an example.
2. What do you mean by array ?
3. Define Package.
4. List the advantages of use cases.
5. Define deployments in architectural modeling ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. List the features of object oriented programming.
2. Compare Multiple inheritance and Multilevel inheritance.
3. Draw the class diagram that shows Employee database.
4. List the use cases used in Railway reservation system ? Discuss.
5. Compare and contrast Event and signals.
6. Write the significance of architectural modelling.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

1. Write a simple Java programs that shows :

   (a) Control statements. (5 marks)

   (b) Exception handling. (5 marks)

Or

Turn over

2. Explain in detail about Java Multithreading with example program.

3. State and explain various relationships in UML. Discuss in detail how we can specify various stereotypes for these relationships.

Or

4. Consider a Education University with following scenario.

   (a) University has student admission process for different courses.

   (b) University has COE section to handle exam process.

   (c) University has staff enrolling system to manage staffs.

   Give proper class diagram and object diagram for the above scenario.

5. Explain in detail about Behavioral modeling with examples.

Or

6. With a neat example, explain the interaction diagram in detail.

7. With a diagrammatic example, explain in detail about the following

   (a) Sequence Diagram.

   (b) collaboration Diagram.

Or

8. With a specific diagrammatic example, explain the following types of diagrams :

   (a) Component Diagram.

   (b) Deployment Diagram.

(4 × 10 = 40 marks)

C 5321 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Information Technology Engineering

IT 09 404—PRINCIPLES OF COMMUNICATION ENGINEERING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

Each question carries 2 *marks.*

1. Draw an AM modulated signal. Mark the carrier and the modulated signal.
2. Define bandwidth and SNR.
3. State the difference between PWM and PPM.
4. Mention the advantages of Foster Seely discriminator.
5. Draw the block diagram of AM receiver.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

1. Draw the frequency spectrum of a FM wave and explain.
2. Bring out the merits of TDM.
3. Compare single side band suppressed carrier AM with double side band suppressed carrier AM.
4. Mention the parameters used for performance comparison of demodulators.
5. List the advantages of super-heterodyne receivers.
6. Mention the characteristics of FM receivers.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

1. (a) Describe the methods of continuous wave modulation for digital signals.

Or

(b) Draw a block diagram of communication system and explain its working.

2. (a) Explain the generation of AM wave using linear modulation method.

Or

(b) Explain the methods to convert FM to PM and PM to FM using suitable block diagrams.

3. (a) Draw the circuit diagram of a ratio detector and explain its operation.

Or

(b) Describe the demodulation of AM signal using linear and envelope detectors.

4. (a) Draw the block diagram of AM transmitter and explain its operation.

Or

(b) Explain the working of FM receiver using a block diagram.

(4 × 10 = 40 marks)

C 5320 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Information Technology Engineering

IT/CS 09 403/PTCS 09 402—COMPUTER ORGANIZATION AND DESIGN

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Differentiate direct and indirect addressing modes.
2. How are decision making techniques implemented in 80 × 86 ?
3. Write the functions of an ALU.
4. Mention the advantages of using exceptions.
5. List the characteristics of I/O devices.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Explain about procedures in 80 × 86 processors.
7. Write about floating point operations in 80 × 86.
8. Explain about building a data path in processors.
9. Explain the features of the Pentium pro processors.
10. Explain about the interfaces in I/O devices.
11. Write about the common framework for memory hierarchies.

(4 × 5 = 20 marks)

Part C

Answer any **four** *questions.*
Each question carries 10 *marks.*

12. (a) Explain about the operations and operands of the computer hardware.

Or

(b) Write in detail about the metrices used for evaluating and comparing the performance of 80 × 86 processors.

13. (a) Explain about the logical operations in 80 × 86.

Or

(b) Write about the multiplication operation in 80 × 86 with an example.

14. (a) Explain in detail about simple and multi-cycle implementations in a processor.

Or

(b) Explain about Micro-programming in detail.

15. (a) Explain the working of virtual memory in detail.

Or

(b) Explain in detail about the design of an I/O system.

(4 × 10 = 40 marks)

C 5319 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Computer Science Engineering

CS 09 405/PTCS 09 404—SYSTEMS PROGRAMMING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define Assembler.
2. Differentiate Loader and Linker.
3. List basic Macro processor functions.
4. Define Operating System.
5. What are the services provided by UNIX ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Explain the functional block diagram of the simplified instructional computer.
2. What are the features of Assemblers ? Discuss.
3. Discuss the Loader Design options with example.
4. Compare and contrast Multiprogramming and Timesharing Systems.
5. Write a note on the Computer System structure.
6. With neat diagram explain UNIX architecture.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

1. Write an algorithm for machine independent assembler design and also discuss with example.

Or

2. Expalin in detail AIX assembler.

3. Write a design procedure for machine dependent Loader and also explain the same with example.

Or

4. Discuss in detail the macro processor design options and implementation examples.

5. Explain in detail the Operating system structure, system components and services.

Or

6. Explain the Virtual Machines with examples.

7. Discuss in detail UNIX kernel data structures.

Or

8. Illustrate the concepts of UNIX system administration process.

(4 × 10 = 40 marks)

C 5318 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Computer Science Engineering

CS 09 404/PTCS 09 403—PROGRAMMING PARADIGMS

Time : Three Hours Maximum : 70 Marks

Part A (Short Answer Questions)

One / two sentences.

Answer **all.**

1. What are context free grammars ?
2. Define inheritance.
3. What are the conditions to be satisfied while declaring abstract classes ?
4. What are the advantages of the event delegation model ?
5. Which are the important aspects of Prolog ?

(5 × 2 = 10 marks)

Part B (Analytical/Problem solving questions)

Answer any **four.**

6. What are the key concepts of functional programming ?
7. What are the characteristics of scripting languages ?
8. Discuss Polymorphic procedure with examples.
9. Describe functional programming with lists.
10. Explain the closed world assumption used by prolog. Why is this a limitation ?
11. Write and explain Assertions and clauses in PROLOG ?

(4 × 5 = 20 marks)

Part C (Descriptive/Analytical/Problem solving questions)

12. (a) Write short notes on Open Grid Service Architecture.

Or

(b) Discuss Grid Computing Adoption in Research and Industry with necessary Examples.

Turn over

13. (a) Explain briefly about object oriented programming concepts .How does it differ from structured programming concepts ?

Or

(b) Explain about inheritance in C++ with examples.

14. (a) Explain the various approaches for expression evaluation.

Or

(b) Describe Storage allocation for lists in detail.

15. (a) Elaborate on each of the syntax of Prolog.

Or

(b) Detail about the main concept of prolog programming with an example.

(4 × 10 = 40 marks)

C 5317 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 09 406/PTEC 09 405—SOLID-STATE DEVICES

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. (a) What are intrinsic and extrinsic semiconductors ?

   (b) What is Zener breakdown ?

   (c) State the application each for Zener diode and varactor diode.

   (d) What is Kirk effect ?

   (e) Define threshold voltage of a MOSFET.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

II. (a) Explain the concept of effective mass and conductivity of carriers.

   (b) Derive the expression for drift current in carriers.

   (c) Write down the diode equation and explain it.

   (d) Write notes on heterojunctions.

   (e) Explain the working of bipolar junction transistors.

   (f) Explain any two short channel effects.

(4 × 5 = 20 marks)

Part C

III. (a) Derive and explain continuity equation.

Or

(b) Write notes on :

(i) Temperature dependence of carrier concentrations.

(ii) Diffusion of carriers.

IV. (a) Explain the working of tunnel diodes.

Or

(b) Write notes on :

(i) GaAs isotype diodes.

(ii) Avalanche breakdown.

V. (a) Explain the working of JFET.

Or

(b) Write notes on :

(i) Frequency limitations of transistor.

(ii) Schottky effect.

VI. (a) Explain the working of enhancement mode MOSFET.

Or

(b) Explain the working of SCR.

(4 × 10 = 40 marks)

C 5316 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 09 405/PTEC 09 404—COMPUTER ORGANIZATION AND ARCHITECTURE

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Differentiate between little endian and big endian byte ordering.
2. Describe the basic instruction types.
3. Explain Cache Coherency problem.
4. Explain the need for I/O interface.
5. What is DMA ? Explain its advantages.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. List the considerations while designing combinational and sequential ALU.
7. What is the difference between write through and write back caches ? List the advantages and disadvantages of each .
8. Describe Address Translation Memory Allocation.
9. What is the advantage of using interrupt initiated data transfer over transfer under program control without an interrupt ?
10. Mention the CPU bus signals used for DMA transfer ? What is cycle stealing in DMA ?
11. Draw the machine cycle diagram and explain the instruction MOV A, M.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. a) Explain micro programmed CPU organization using a block diagram.

Or

b) Describe the hardwired control and micro programmed control in detail.

13. a) Explain various elements of cache design and various mapping techniques used with cache.

Or

b) List and discuss the different types of Read-Only Memories.

14. a) Explain I/O and system bus control.

Or

b) Explain processor level parallelism using suitable block diagrams.

15. a) Draw a block diagram and explain the working of memory mapped I/O.

Or

b) Write a program in 8085 to add two BCD numbers.

(4 × 10 = 40 marks)

C 5315 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 09 404/PTEC 09 403—ANALOG COMMUNICATION

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Let Y = $g(k)$ = cos (X) be a function of Random variable. Find its probability density function and E[Y].
2. Define Covariance function.
3. Relate efficiency and modulation index of an AM wave.
4. Draw the phasor diagram and label the components.
5. Define Noise Equivalent Bandwidth.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Find the mean value and the variance of a random variable X which is uniformly distributed between $x = a$ and $x = b$.
7. Determine the power spectrum of the process $X(t) = A_e \cos(w_o t + \theta)$; θ is uniformly distributed over $(-x, +x)$.
8. With necessary conditions explain the operation of an Envelope Detector.
9. Explain the high-level transmitter and low-level transmitter. Discuss their advantages and disadvantages.
10. Explain the working of a Double Conversion receiver.
11. A 10 kΩ and a 20 kΩ resistor are both at a room temperature of 27° C. For a 100 kHz bandwidth, determine the r.m.s. value of the thermal noise voltage across each one of them.

(4 × 5 = 20 marks)

Part C

12. (a) Gaussian density function is given as $f_X(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-(x-m)^2/2\sigma^2}$. Show that $\frac{1}{2\pi\sigma^2}$ is a normalization factor required to make the total area under the density function equal to 1.

Or

(b) "When a stationary process is applied as input to an LTI system, the input and output processes are jointly stationary"—Justify.

13. (a) Explain any one method of SSB-SC generation and detection.

Or

(b) Derive an expression for Narrow-Band FM generation.

14. (a) Explain superheterodyne receiver and state its advantages over Tuned Radio Frequency receiver.

Or

(b) Explain capture effect and threshold effect in FM receivers.

15. (a) Explain Noise Equivalent temperature. A low-noise amplifier of 30 K equivlent noise temperature and 20 dB available power gain precedes a microwave receiver which has a noise figure of 25 dB. What is the overall noise equivalent temperature if the room temperature is 27° C.

Or

(b) Derive an expression for the output signal-to-noise ratio of a DSB-SC receiver.

(4 × 10 = 40 marks)

C 5314 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 09 403/PTEC 09 402—ELECTRONIC CIRCUITS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

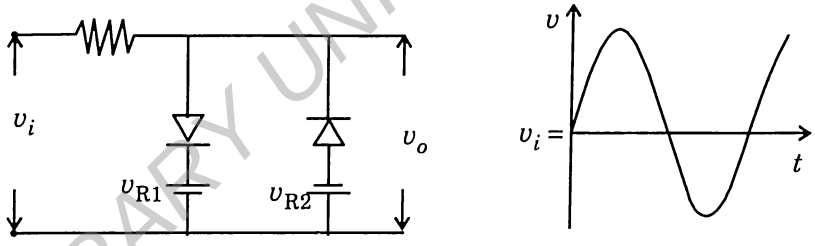
1. Define PIV.
2. What is the power efficiency of class A and class B amplifier ?
3. State the condition for oscillation.
4. What is the need for sweep circuits ?
5. How to find the value of capacitor in disc or in tubular form.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. For the circuit given below draw the output :



7. How the BJT amplifier is modeled in low frequency region ? Explain its response.
8. Explain the V-I characteristics of JFET.
9. Explain the operation of BJT switch with inductive load.
10. What is the effect of temperature on BJT parameters ? Explain.
11. Comment on the harmonic distorsion present in power amplifier.

(4 × 5 = 20 marks)

Turn over

Part C

12. Describe the operation and characteristics of CE configuration.

Or

13. Explain the operation of full wave rectifier and Zener diode voltage regulator.

14. Discuss briefly the different configurations of feedback amplifiers.

Or

15. Explain the operation of class C power amplifier and code amplifier.

16. Describe the operation and characteristics of UJT oscillator.

Or

17. Discuss briefly the large signal operation of differential amplifier.

18. Explain the operation of Bistable multivibrator with suitable circuit.

Or

19. Describe the operation of emitter coupled monoshot.

(4 × 10 = 40 marks)

C 5313 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 09 406/PTEE 09 405—ELECTRICAL MEASUREMENTS AND INSTRUMENTATION SYSTEMS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

I. a) Define ratio and phase angle error.

b) Compare permanent magnet moving coil and moving iron instrument.

c) State the basic principle of moving iron instrument.

d) What are the characteristics of transducers ?

e) What are display devices ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

II. a) What are the different methods of obtaining the controlling torque in an indicating instrument ?

b) Draw the equivalent circuit and phasor diagram of a current transformer.

c) How do you measure the earth electrode resistance ? Explain it.

d) Write the general and dynamic characteristics of transducer.

e) Discuss the Hibbert's magnetic standard.

f) Elucidate the time and period measurements.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

III. A i) Draw the equivalent circuit and phasor diagram of a potential transformer. Derive the expressions for its ratio and phase angle errors.

Or

i) Discuss in detail various types of errors associated in measurement and how these errors can be minimised ?

B i) Explain the working principle of measurements of capacitance using Schering Bridge.

Or

ii) Discuss the localization of cable fault by Murray loop tests with necessary diagram.

C i) With the help of necessary diagram explain the working of RVDT.

Or

ii) Draw the block diagram and explain the digital time and period measurements.

D i) Briefly discuss about display methods and devices.

Or

ii) Discuss in detail the construction of a storage type oscilloscope. What are the accessories for a CRO ?

(4 × 10 = 40 marks)

C 5312 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 09 405—PTEE 09 404—DIGITAL ELECTRONICS

Time : Three Hours Maximum : 70 Marks

Answer **all** *questions.*

Part A

Answer **all** *the questions.*
Each question carries 2 *marks.*

I. (a) What is propagation delay ?

(b) Convert the given expression in canonical SOP form Y = AC + AB + BC.

(c) Why was PAL developed ?

(d) Give the classifications of sequential circuits ?

(e) State the function of control bus.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

II. (a) Draw the circuit of 2 input CMOS NAND Gate. What are its advantages over TTL ?

(b) Explain the operation of 4 to 10 line decoder with necessary logic diagram.

(c) Define ROM. PROM and EPROM.

(d) Draw and explain the operation of four bit Johnson counter.

(e) List the salient feature of 8085 microprocessor.

(f) Discuss the address bus.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

III. (a) (i) Explain the operation of 3 *I/P* TTL NAND Gate with required diagram and truth table.

Or

(ii) Explain the characteristics and implementation of the following digital logic families :

(a) CMOS. (b) ECL.

(c) TTL.

(b) (i) State and prove the theorems of Boolean algebra with illustration.

Or

(ii) Explain how will build a 64 input MUX using nine 8 input MUXs.

(c) (i) Design a sequential circuit using JK flip-flop for the state table [use state diagram].

Or

(ii) Using SR flip-flops, design a parallel counter which counts in the sequence

000, 111, 101, 110, 001, 010, 000 .....

(d) (i) Explain arithmetic logic units in brief.

Or

(ii) Discuss the VHDL structural modeling with simple examples.

(4 × 10 = 40 marks)

C 5311 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 09 404/PTEE 09 403—DC MACHINES AND TRANSFORMERS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*
Each question carries 2 *marks.*

I. (a) Compare electric and magnetic circuits.

(b) Write down the e.m.f. equation for d.c. Generator.

(c) Define Back e.m.f. in a D.C. Motor.

(d) Why transformers are rated in kVA ?

(e) Give the role of tertiary winding in Transformer.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

II. (a) Describe the principle of a typical magnetic circuit with air gap and explain.

(b) A 4 pole D.C. Shunt Generator with lap connected armature supplies 5 kilowatt at 230 Volts. The armature and field copper losses are 360 Watts and 200 Watts respectively. Calculate the generated EMF ?

(c) A 220 V d. c. shunt motor runs at a speed of 850 r.p.m. and takes a current of 30 A from the mains. Calculate speed if the torque is doubled. Armature resistance of the motor is 0.2 Ω.

(d) A 230 V, D.C. shunt motor, takes an armature current at 3.33 A at rated voltage and at a no load speed of 1000 RPM. The resistances of the armature circuit and field circuit are 0.3 Ω and 160 Ω respectively. The line current at full load and rated voltage is 40 A. Calculate, at full load, the speed and the developed torque in case the armature reaction weakens the no load flux by 4 %.

(e) A 500 KVA Transformer has a core loss of 2200 watts and a full load copper loss of 7500 watts. If the power factor of the load is 0.90 lagging, Evaluate the full load efficiency and the KVA load at which maximum efficiency occurs.

(f) Derive the condition for maximum efficiency in a transformer.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

III. (a) (i) Explain about the magnetization curve of Ferro-magnetic material.

Or

(ii) Draw and explain the general block diagram of an electromechanical energy conversion device.

(b) (i) A lap wound dc shunt generator having 80 slots with 10 conductors per slot generates an e.m.f. of 400 V on no load when running at 1000 r.p.m. At what speed it should run to generate a voltage of 220 V on open circuit.

Or

(ii) Draw and explain the no-load and load characteristics of DC shunt and compound generators.

(c) (i) Describe the working of 3 point starter for DC shunt motor with neat diagram.

Or

(ii) With the help of neat circuit diagram, explain Swinburne's test and derive the relations for efficiency (both for generator and motor).

(d) (i) Draw and explain the no load phasor diagram of a single phase transformer.

Or

(ii) A 120 kVA, 6000/400 V, Y/Y, 3-phase, 50 Hz transformer has a iron loss of 1800 W. The maximum efficiency occurs at $\frac{3}{4}$ full loads. Find the efficiency of the transformer at :

(i) Full load and 0.8 p.f.

(ii) The maximum efficiency at unity p.f.

(4 × 10 = 40 marks)

C 5310 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 09 403/PTEE 09 402—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

I. a) Define periodic signal and non-periodic signal.

b) State the BIBO criterion for stability.

c) Define frequency response of continuous time systems.

d) What is Pole zero plot ?

e) Write the final value theorem for Laplace transforms.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

II. a) Determine whether the following signal is periodic. If periodic, determine the fundamental period : X(t) = 3cost + 4cos(t/2).

b) Determine whether the following systems are time variant or time-invariant. y(t) = tx(t).

c) Plot Pole - Zero of the following transfer diagram.

i) $(S + 2) / (S^2 + 2S + 2)$

ii) $(S + 3) / (S(S^2 + 4) (S + 2) (S + 1))$

d) Explain any two properties of DTFT.

e) Discuss the solution of LCCDE with initial conditions.

f) Determine the Nyquist sampling rate and Nyquist sampling intervals for $\sin(200 \pi t) + 3 \sin^2(120 \pi t)$

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

III. a) i) Determine whether the following systems are Time-invarient or not $Y(t) = t\,x(t)$ and $y(n) = x(2n)$.

Or

ii) Discuss about the elementary continuous time signal in detail.

b) i) Find the Fourier series for the periodic signal $x(t) = t$, $0 \leq t \leq 1$ and repeats every 1 sec.

Or

ii) Consider an LTI system with an impulse response $h(t) = te^{-3t}\,u(t)$ and an input $x(t)$ defined by $x(t) = te^{-4t}u(t)$. Use Fourier transform to determine the frequency response $Y(j\omega)$ and the response $y(t)$.

c) i) Find the DTFT of : i) $x[n] = 2n\,u[n]$; ii) $x[n] = (0.5)n + 2 - n\,u(-n-1)$.

Or

ii) State and prove sampling theorem.

d) i) Explain the residue method of computing the inverse Z-transform.

Or

ii) Compute the response of the system $y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n-) + x(n-2)$ to the input $x(n) = nu(n)$.

(4 × 10 = 40 marks)

C 5309 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Mechanical Engineering

ME 09 406/PTME 09 405—THERMODYNAMICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is meant by quasi-static process ?
2. Differentiate intensive and extensive properties.
3. Why is the COP of an heat pump is higher than that of a refrigerator, if they both operate between the same temperature limits ?
4. If atmospheric air (at 101325 Pa) contains 21 % oxygen and 79 % nitrogen (vol %), what is the partial pressure of oxygen ?
5. What are the psychrometric properties by which weather forecast are specified ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Describe steady flow energy equation and give the expression for the expansion of gases in a gas turbine with suitable assumptions.
2. Explain about different types of work transfer with examples.
3. Define a, heat engine, refrigerator and heat pump. Differentiate them in-terms of heat supply heat rejection and work transfer.
4. State and prove Carnot principle.
5. Differentiate between a ideal gas and real gas. What are the reasons of deviation of a real gas from a ideal gas.

Turn over

6. A sling psychrometer reads 40° C DBT and 36° C WBT. Find the humidity ratio, relative humidity, dew point temperature, specific volume and enthalpy of air using psychrometric chart.

(4 × 5 = 20 marks)

Part C

Answer any **four** *questions.*
Each question carries 10 *marks.*

1. A blower handles 1 kg/sec of air at 293 K and consumes a power of 15 kW. The inlet and outlet velocities of air are 100 m/sec and 150 m/sec respectively. Find the exit air temperature assuming adiabatic conditions. Take C_p of air as 1.005 KJ/Kg K.

2. Air contained in the cylinder and piston arrangement comprises the system. A cycle is completed by four processes 1–2, 2–3, 3–4 and 4–1. The energy transfers are listed below. Complete the table and determine the network in kJ. Also check the validity of the first law of thermodynamics.

Process	Q (kJ)	W(kJ)	ΔU (kJ)
1–2	40	?	25
2–3	20	– 10	?
3–4	– 20	?	?
4–1	0	8	?

3. (i) Represent the Carnot cycle on p-V and T-s planes and deduce an expression for the thermal efficiency in-terms of temperatures. (8 marks)

   (ii) What are the causes of irreversibility of a process ? (2 marks)

4. A heat engine is supplied heat at the rate of 1700 kJ/min at 120°C and gives an output of 10 kW. Determine the thermal efficiency, temperature of the sink and the rate of heat rejection.

5. Define pure substances. Draw and explain the p-V, p-T, T-s diagrams for pure substance.

6. 0.45 kg of CO and 1 kg of air is contained in a vessel of volume 0.4 m^3 at 15° C. Air has 23.3% of O_2 and 76.7 % of N_2 by mass. Calculate the partial pressure of each constituent and the total pressure in the vessel. Molar mass is of CO, CO_2 and N_2 are 28, 32 and 28 kg/k mol.

7. Deduce the Maxwells relations and from the third relation deduce the Clausius-Clayperon equation.

8. If a room of 75 m^3 contains air at 25° C and 100 kPa at 75 % relative humidity, determine the partial pressure of dry air, specific humidity, enthalpy, mass of dry air and water vapour in the room.

(4 × 10 = 40 marks)

C 5308 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 09 405/PTME 09 404—FLUID MACHINERY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1 Classify the fluid machines.

2 Define Froude's number.

3 What is cavitation ?

4 How can we obtain a high head in a pump network ?

5 Define slip of a reciprocating pump.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6 Describe jet propulsion of a tank with an orifice.

7 Prove that hydraulic efficiency of a Pelton wheel is maximum when the velocity of the wheel is half the velocity of jet of water at inlet.

8 A turbine develops 7225 kW power under a head of 25 m at 135 r.p.m. Calculate the specific speed of the turbine and state the type of the turbine.

9 Define the following heads of a centrifugal pump : (i) Suction head ; (ii) Static head ; and (iii) Manometric head.

10 Prove that area of indicator diagram is proportional to the work done by the reciprocating pump.

11 Describe with neat sketch, the working of a hydraulic ram.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *the questions.*

12. (a) A 7.5 cm diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate : (i) When the plate is stationary ; and (ii) When the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving.

Or

(b) What are the methods of dimensional analysis? Describe the Rayleigh's method for dimensional analysis.

13. (a) A Pelton wheel is to be designed for a head of 60 m when running at 200 rpm. The Pelton wheel develops 95 kW shaft power. The velocity of the buckets = 0.45 times the velocity of the jet, overall efficiency = 0.85 and co-efficient of the velocity is equal to 0.98.

Or

(b) A reaction turbine works at 450 rpm under a head of 120 m. Its diameter at inlet is 120 cm and the flow area is 0.4 m^2. The angles made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Calculate :

(i) Volume flow rate ;

(ii) Power developed ; and

(iii) Hydraulic efficiency.

Assume whirl at outlet to be zero.

14. (a) A centrifugal pump having outer diameter equal to two times the inner diameter at running at 1000 rpm works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine :

(i) Vane angle at inlet ;

(ii) Work done by impeller on water per second ; and

(iii) Manometric efficiency.

Or

(b) With a neat sketch, explain the principle and working of a centrifugal pump.

15. (a) A single-acting reciprocating pump has a stroke length of 150 mm, suction pipe is 7 m long and the ratio of suction pipe diameter to the piston is ¾. The water level in the sump is 2.5 m below the axis of the pump cylinder and the pipe connecting the sump and pump cylinder is 75 mm in diameter. If the crank is running at 75 rpm, determine the pressure head on the piston at the beginning, middle and end of the suction stroke. Take friction co-efficient, $f = 0.01$.

Or

(b) Explain with the aid of a neat sketch the construction and working of a gear pump. Also discuss its performance characteristics.

(4 × 10 = 40 marks)

C 5307 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME09 404/PTME 09 403—CASTING AND JOINING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

1. What are the elements of a gating system ?
2. What is an inert gas used in low-pressure castings ?
3. How is shell-mould casting different than conventional sand casting ?
4. What are the three flames used in gas welding ?
5. What is braze welding ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Explain about solidification of metals.
7. Discuss important defects occurring in castings.
8. Describe casting of single crystal components.
9. Discuss inspection and testing of welded joints.
10. Explain thermit welding with neat sketch.
11. Explain different filler materials used in brazing.

(4 × 5 = 20 marks)

Part C

Answer **all** *the questions.*

12. Explain the construction and operation of cupola furnace with neat sketch.

Or

13. Discuss different types of patterns used in casting with neat diagrams.

Turn over

14. Explain ceramic mould casting and low pressure casting processes with all details and also state its merits and demerits

Or

15. Describe permanent mould casting and cold-chamber die casting processes with sketches and write its applications and limitations.

16. With the help of neat sketches explain the working principle of ultrasonic welding and electro slag welding. State its applications advantages.

Or

17. Write notes on submerged arc welding and oxyacetylene welding. List its applications and limitations.

18. Explain the following : (a) Iron soldering and Dip soldering ; and (b) Adhesive bonding.

Or

19. Discuss the following : (a) Metal-ceramic joining ; and (b) Diffusion bonding.

(4 × 10 = 40 marks)

C 5306 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 09 403/PTME 09 402—MECHANICS OF SOLIDS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

1. State Hooke's law.
2. 'A hollow shaft has greater strength than solid shaft of equal weight'. Justify the statement.
3. State the relationship between shear force and bending moment.
4. What do you mean by 'simple bending' ?
5. Define the terms : Principal planes and principal stresses.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. A bar of 30 mm. diameter is subjected to a pull of 100 kN. The measured extension on a gauge length of 250 mm is 0.15 mm and the change in diameter is 0.00 475 mm. Calculate (i) Young's modulus ; (ii) Poisson's ratio ; and (iii) Bulk modulus.
7. A solid shaft is subjected to a torque of 45 kNm. If the angle of twist is 0.5° per meter length of shaft and shear stress is not to exceed 90 MN/m^2, find the suitable diameter of the shaft. Take C = 80 GN/m^2.
8. Draw shear force and bending is moment diagrams for the cantilever shown in Fig.1.

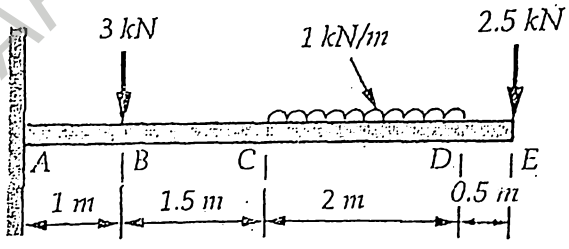


Fig. 1

Turn over

9. A steel plate of width 60 mm and thickness 10 mm is bent into a circular arc of radius 10 m. Determine the maximum stress induced and the bending moment which will produce the maximum stress. Take $E = 2 \times 10^5$ N/mm^2.

10. Find the slope and deflection of a simply supported beam carrying a point load at its centre using moment area method.

11. A point in a strained material is subjected to stresses shown in Fig. 2. Determine the normal and tangential stresses across the oblique plane.

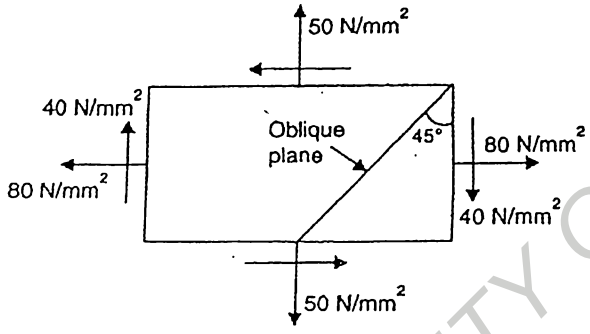


Fig. 2

(4 × 5 = 20 marks)

Part C

Answer **all** *the questions.*

12. (a) A circular steel bar having three segments is subjected to various forces at different cross-sections as shown in Fig. 3. Determine the necessary force to be applied at section C for the equilibrium of the bar. Also, find the total elongation of the bar. Take E = 202 GPa.

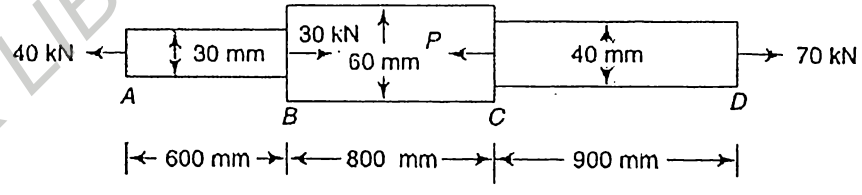


Fig. 3

Or

(b) A metallic bar 300 mm × 120 mm × 50 mm is loaded as shown in Fig.4. Find the change in volume. Take E = 2×10^5 N/mm^2 and Poisson's ratio = 0.3. Also find the change that should be made in 4.5 MN load, in order that there is no change in the volume of the bar.

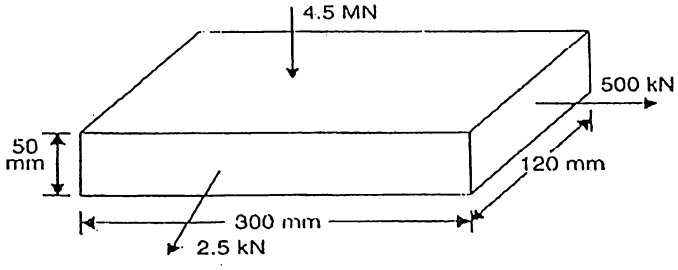


Fig. 3

13. (a) A solid cylindrical shaft is to transmit 500 kW power at 200 r.p.m. : (i) If the shear stress is not to exceed 90 N/mm^2, find its diameter ; and (ii) What percent saving in weight would be obtained if this shaft is replaced by a hollow shaft whose internal diameter is 0.7 of the external diameter, the length, the material and maximum shear stress being same ?

Or

(b) A 10 m long simply supported beam carries two point loads of 10 kN and 6 kN at 2 m and 9 m respectively from the left end as shown in Fig.5. It also has a uniformly distributed load of 4 kN/ run for the length between 4 m and 7 m from the left end.

Draw shear force and bending moment diagrams.

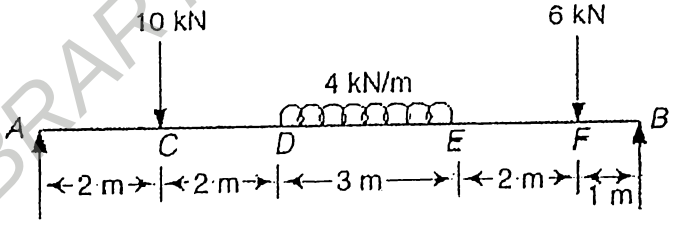


Fig. 5

14. (a) A beam of T section has a length of 2.5 m and is subjected to a point load as shown in Fig.6. Calculate the compressive bending stress and plot the stress distribution across the cross-section of the beam. The maximum tensile stress is limited to 300 MPa. Calculate the value of W.

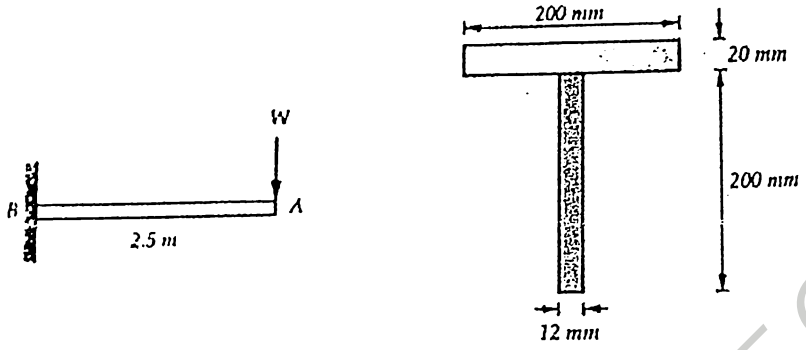


Fig. 6

Or

(b) A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Find the deflection under each load. Take $E = 2 \times 10^5$ N/mm^2 and $I = 85 \times 10^6$ mm^4.

15. (a) At a point in a bracket the stresses on two mutually perpendicular planes are 400 N/mm^2 (tensile) and 300 N/mm^2 (tensile). The shear stress across these planes is 200 N/mm^2. Determine the magnitude and directions of principal stresses and maximum shear stress.

Or

(b) An offset link subjected to a force of 25 kN is shown in Fig.7 . It is made of grey cast iron FG 300 (σ_u = 300 N/mm^2) and the factor of safety is 3. Determine the dimensions of the cross-section of the link.

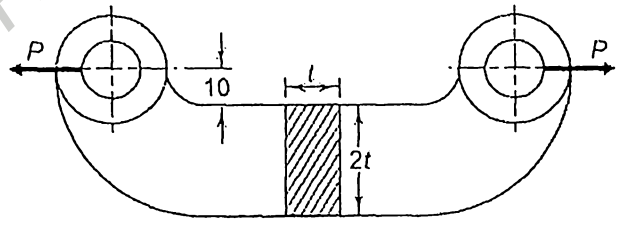


Fig. 7

(4 × 10 = 40 marks)

C 5305 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Civil Engineering

CE 09 408—CIVIL ENGINEERING DRAWING—I

Time : Three Hours Maximum : 50 Marks

Answer any **two** *questions from* **Module I** *and question from* **Module II** *is* **compulsory.**

Assume any missing date wherever necessary.

Module I

1. Draw the front elevation and cross sectional view of a paneled door 2.10 m × 1.40 m height for an opening in bed room in 230 mm thick brick wall.

(10 marks)

2. Draw to a suitable scale, elevation of a steel truss , for a span of 15 m and height of 4.0 m. Also show the important joint details. Use following sections. Wall thickness is 230 mm and angle of roof is :

Bottom tie member	:	ISA 100 × 100 × 10
Principal Rafter	:	2 ISA 90 × 90 × 8
Strut	:	ISA 90 × 90 × 10
Purlin		100 × 75 × 8
Cleat angle		ISA 75 × 75 × 8
All other members		80 × 10 flat

(10 marks)

3. Draw a typical reinforcing details of a 90° flat turn staircase for the details given below. Tread = 30cm, Riser = 15cm, Width = 1.1 m, Landing width = 1.2m No of steps in a flight is equal to 6 nos. Height of the building from the finished floor level = 3.2m,Head room = 2.5m, Reinforcement details : Main rod 12mm tor steel at 175mm C/C, Distributor 8mm tor steel at 200mmC/C. Draw Plan and the Longitudinal section Through the staircase.

(10 marks)

Turn over

Module II

4. The line plan shown in the fig shows the internal dimension in mm of a residential building.

Depth below GL. – 1300mm , width of cement concrete footing is 900 mm, there are two footing in brick masonry in cement mortar in 1 : 4 the first footing is of width 350 mm height 300 mm second footing is of width 300 mm and height 400 mm . Height of plinth above GL750mm. width 350 mm. Basement is filled with sand, damp proof course of 35 mm thick in cement mortar 1 : 3.5 is to be provided. Flooring is smooth plastering in cement mortar 1 : 3,10 mm thick. Provide steps with rise of 180 and tread 320 mm . wall in brick work with cement mortar 1 : 5, 230 mm thick height of wall from floor lever to roof ceiling is 3300 mm.

RCC roof slab 125 mm thick of mix 1 : 2 : 5. Provide weathering course 90mm thick. Sunshade with 700mm extending by 125mm on either side of door and window. Parapet is brick work 1 : 4.5 mortar with 230mm thick and 600 mm height above roof slab.

Window W1 1200mm × 1200mm Window W2 900mm × 1200mm placed at 900 mm above floor level.

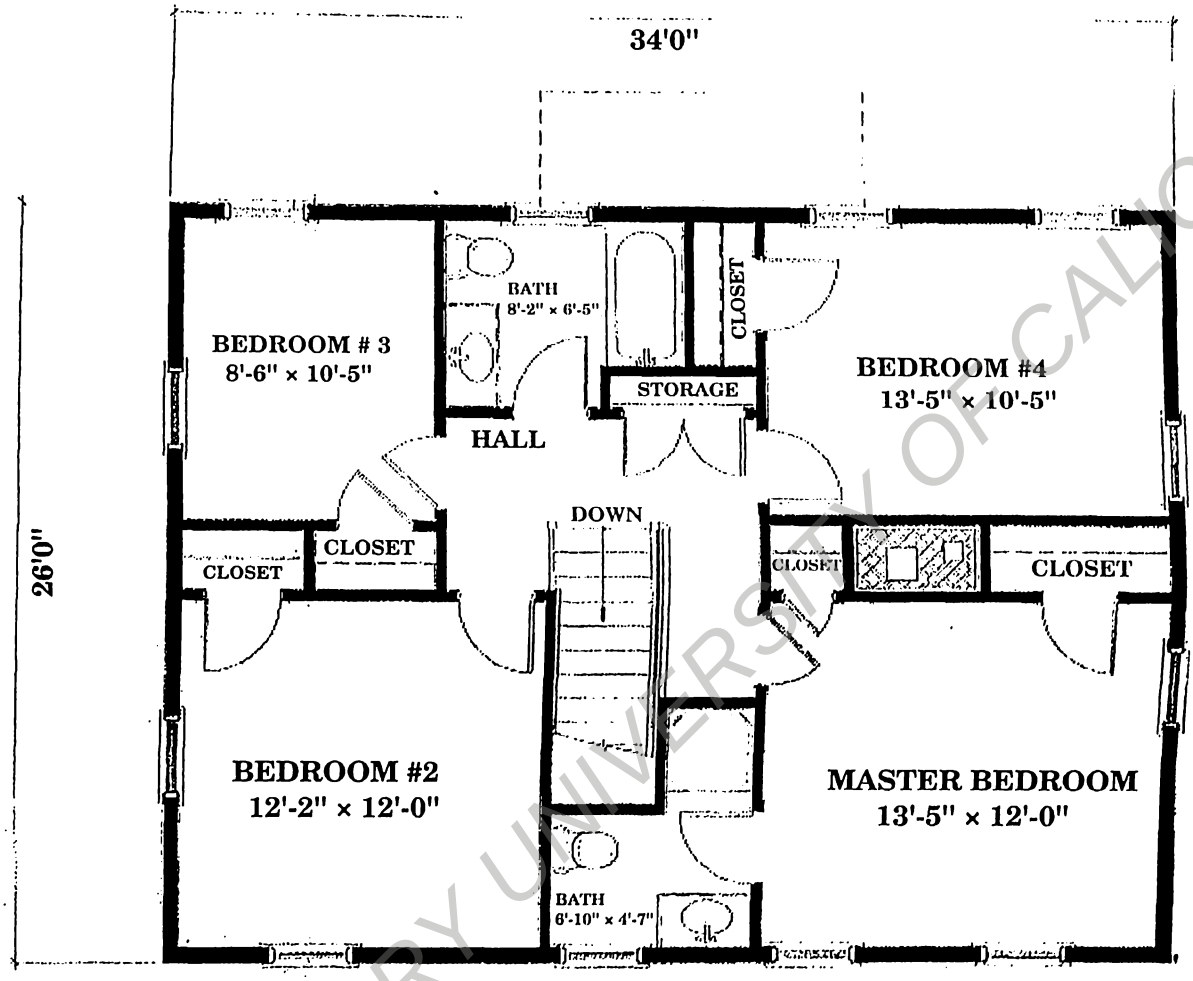
Door Entrance : D1 1400mm × 2500mm Other Door D2 1000 mm × 2100 mm

Ventilator V1 600 × 600 mm placed at 1500 mm above floor level.

Any data missing can be assumed suitably.

Draw the following detailed Plan, elevation and sectional elevation along section shown in fig.

(30 marks)



C 5304 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Civil Engineering

CE 09 406/PTCE 09 405—SURVEYING—II

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Define Tacheometric Surveying.
2. What is a Subtense Bar ?
3. What do you understand by the term triangulation ?
4. What is sundial ?
5. List the uses of photogrammetry.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. List out the different systems of tacheometric survey.
7. Mention the points to be considered while using a subtense bar.
8. Discuss Most Probable Value and Most Probable Error.
9. Define celestial sphere and azimuth axis.
10. What is trigonometric levelling ?
11. Explain the principle of least squares.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. a) What is tacheometric survey ? Explain the instruments used.

Or

b) Explain any two methods employed in sounding.

Turn over

13. a) An angle A was measured by different persons and the following are the values:

Angle	*Number of measurements*
65° 30' 10"	2
65° 29'50"	3
65° 30' 00"	3
65° 30'20"	4
65° 30' 10"	3

Find the most probable value of the angle.

Or

b) Discuss the principle of triangulation and classification of triangulation.

14. a) Explain the different co-ordinate systems in astronomical surveying.

Or

b) Calculate the distance in kilometers between two points A and B along the parallel of latitude, given that :

(i) Lat. of A, 28° 42' N : longitude of A, 31° 12' W

Lat. of B, 28° 42' N : longitude of B, 47° 24' W

(ii) Lat. of A, 12° 36' S : longitude of A, 115° 6' W

Lat. of B, 12° 36' S : longitude of B, 150 ° 24' E.

15. a) Explain few points about photogrammetric surveying.

Or

b) Discuss the various methods of trigonometric leveling.

(4 × 10 = 40 marks)

C 5303 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Civil Engineering

CE 09 405/PTCE 09 404—ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT

Time : Three Hours Maximum : 70 Marks

Section 1 (Engineering Economics)

PART A

Answer **all** *questions.*

1. Briefly explain the flow in an economy with diagram.
2. Discuss marginal cost and revenue.
3. Write a note on the single payment factor.

(3 × 5 = 15 marks)

PART B

Answer one question completely from each module.

Module 1

4. Krishna Company Ltd. has the following details :

   Fixed cost = Rs. 40,00,000/- Variable cost per unit = Rs. 300/-

   Selling price per unit = Rs. 500/- Find

   (a) The break-even sales quantity

   (b) The break-even sales

   (c) If the actual production quantity is 1,20,000/-, find the following :

   (i) Contribution

   (ii) Margin of safety by all methods.

Or

5. Explain the Foreign Trade Policy and Monetary policy.

Turn over

Module 2

6. A company wants to set up a reserve which will help the company to have an annual equivalent amount of Rs. 10,00,000/- for the next 20 years towards its employee welfare measures. The reserve is assumed to grow at the rate of 15% annually. Find the single payment that must be made now as the reserve amount.

Or

7. With neat sketch explain the Break-even analysis process.

(2 × 10 = 20 marks)

Section 2 (Principles of Management)

PART A

Answer **all** *questions.*

1. Briefly explain the function of management.
2. Describe the job analysis and evaluation.
3. Write short notes on marketing mix and overheads.

(3 × 5 = 15 marks)

PART B

Answer one question completely from each module.

Module 1

4. Discuss the Taylor principles of management. How are they different from Fayol's fourteen principles of management ?

Or

5. (a) Explain the multistage decision and decision tree. (5 marks)

   (b) Discuss the selection and recruitment process. (5 marks)

Module 2

6. (a) Discuss the basic concepts of journal, trade and ledger. (5 marks)

   (b) Explain the allocation of overheads in financial management. (5 marks)

Or

7. Explain the various phases of project management.

[2 × 10 = 20 marks]

C 5302 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Civil Engineering

CE 09 404—PTCE 09 403—STRUCTURAL ANALYSIS—I

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. State the difference between strain energy method and unit load method in the determination of deflection of structures.

2. State Muller-Breslau principle.

3. Classify arches according to the support conditions.

4. Considering a three hinged parabolic arch of span 'l' and subjected to a moving point load W, indicate the positions of the point load for maximum negative and positive bending moments in a three hinged arch.

5. How is sway accounted for in slope deflection method for portal frames ?

(5 × 2 = 10 marks)

Part B

Answer **four** *questions.*

6. What is virtual work and state the principle of virtual work ?

7. Give the conditions that will cause sway in portal frames.

Turn over

8. A cantilever beam which is curved in the shape of a quadrant of a circle is loaded as shown in Figure 1. The radius of curvature of curved beam is R, Young's modulus of the material is E and second moment of the area is about an axis perpendicular to the plane of the paper through the centroid of the cross-section. Find the vertical displacement of point A on the curved beam.

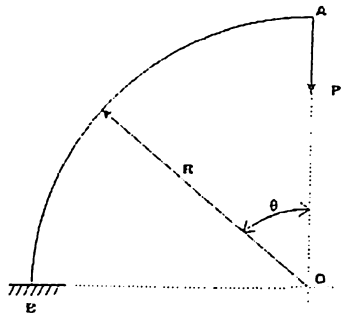


Figure 1

9. Discuss the method for sketching influence line diagram for bridge trusses.
10. A light cable 18 m long, is supported at two ends at the same level. The supports are 16 m apart. The cable supports 120 N load dividing the distance into two equal parts. Find the shape of the cable and tension in cable.
11. Brief on yielding of support in an arch.

(4 × 5 = 20 marks)

Part C

Answer **four** *questions.*

12. Determine the horizontal displacement and rotation at roller support in the frame shown in Figure 2. Flexural rigidity EI is constant throughout.

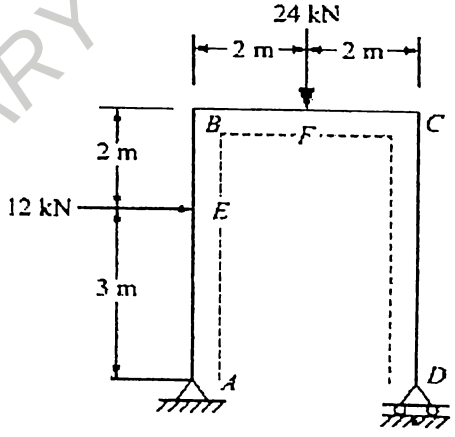


Figure 2

Or

13. Determine the horizontal displacement of the roller end D of the portal frame shown in Figure 3. EI is 8000 kNm^2 throughout.

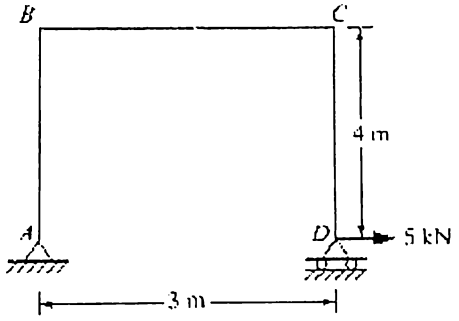


Figure 3

14. A fixed beam of span L is subjected to a concentrated load W at a distance a from end A as shown in Figure 4. Determine the end moments developed.

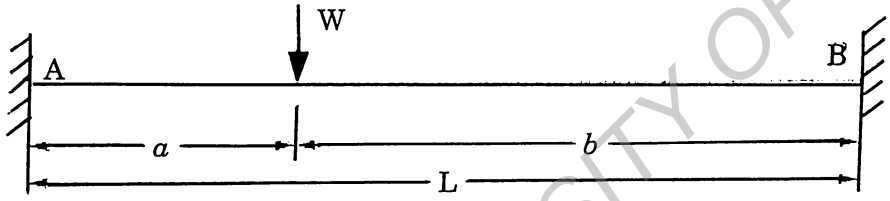


Figure 4

Or

15. Determine the horizontal displacement of roller support of the truss shown in Figure 5. The cross-sectional areas of all top chord members are 6000 mm^2 and the other members have cross-sectional area = 3000 mm^2. Take E = 200 kN/mm^2

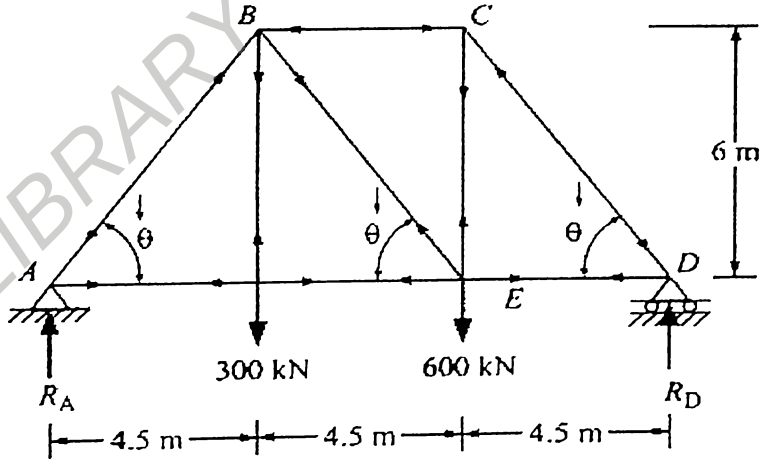


Figure 5

16. Four point loads, 8, 15, 15 and 10 kN have centre to centre spacing of 2 m between consecutive loads and they traverse a girder of 30 m span from left to right with 10 kN load lending. Calculate the maximum bending moment and shear force at 8 m from the left support.

Or

17. A train of 5 wheel loads crosses a simply supported beam of span 22.5 m. Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span.

18. A three hinged semi-circular arch of radius R carries a uniformly distributed load of intensity w/unit length over its entire horizontal span. Determine the reactions of supports and maximum bending moment in the arch.

Or

19. A cable (shown in Figure 6) is suspended from the points A and B which are 80 m apart horizontally and are at different levels, the point A being 5 m vertically higher than the point B and the lowest point in the cable is 10 m below A. The cable is subjected to a uniformly distributed load of 30 kN/m over the horizontal span. Determine the horizontal and vertical reactions at each end and also the maximum tension in the cable.

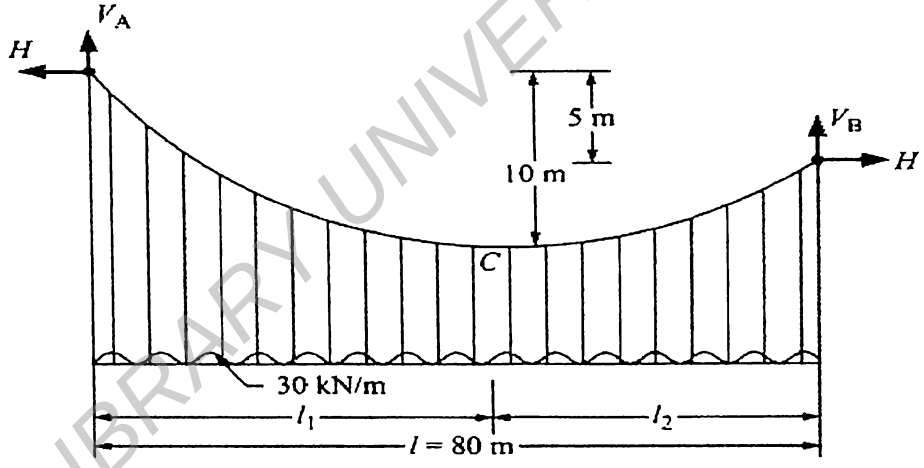


Figure 6

(4 × 10 = 40 marks)

C 5301 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Civil Engineering

CE 09 403/PTCE 09 402—FLUID MECHANICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What are the properties of ideal fluids ?
2. Define centre of pressure.
3. Name the different forces present in a fluid flow.
4. What is a Syphon ?
5. Define the terms : drag and lift.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. A simple U-tube manometer is installed across an orificemeter. The manometer is filled with mercury (sp. gravity = 13.6) and the liquid above the mercury is carbon tetrachloride (sp. gravity = 1.6). The manometer reads 200 mm. What is the pressure difference over the manometer in newtons per square metre.
7. Find the density of a metallic body which bloats at the interface of mercury of specific gravity 13.6 and water such that 40 % of its volume is sub-merged in mercury and 60 % in water.
8. The head of water over an orifice of diameter 40 mm is 10 m. Find the actual discharge and actual velocity of the jet at vena-contracta. Take C_d = 0.6 and C_v = 0.98.
9. Obtain an expression for the loss of head due to sudden contraction in the pipe.

Turn over

10. A liquid with a specific gravity 2.8 and a viscosity 0.8 poise flows through a smooth pipe of unknown diameter, resulting in a pressure drop of 800 N/m^2 in 2 km length of the pipe. What is the pipe diameter if the mass flow rate is 2500 kg/h.

11. Define the following non-dimensional numbers : (i) Froude's number ; and (ii) Mach's number.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) A 400 mm diameter shaft is rotating at 200 rpm in a bearing of length 120 mm. If the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is 0.7 Ns/m^2. Determine : (i) Torque required to overcome friction in bearing ; and (ii) Power utilized in overcoming viscous resistance. Assume a linear velocity profile.

Or

(b) For a two-dimensional flow the velocity potential function is given by the expression, $\Phi = x^2 - y^2$. (i) Determine the velocity components in x and y directions ; and (ii) Show that the velocity components satisfy the conditions of flow continuity and irrotationality.

13. (a) Derive Bernoulli's equation for the fluid flow.

Or

(b) What is a venturi meter ? Derive an expression for the discharge through a venturimeter.

14. (a) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 in and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering : (i) Minor losses ; and (ii) Nneglecting minor losses.

Or

(b) Derive an expression for loss of head due to friction in pipes.

15. (a) The pressure difference Δp in a pipe of diameter D and length L due to turbulent flow depends on the velocity V, viscosity μ, density ρ and roughness k. Using Buckingham's $\prod$ theorem, obtain an expression for Δp.

Or

(b) A pipe of diameter 1.5 m is required to transport an oil of specific gravity 0.9 and viscosity 0.03 poise at the rate of 3000 litre/sec. Tests were conducted on a 15 cm diameter pipe using water at 20°C. Find the velocity and rate of flow. Viscosity of water at 20°C = 0.01 poise.

(4 × 10 = 40 marks)

C 5300 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2009 SCHEME) EXAMINATION, APRIL 2021

Chemical Engineering

CH 09 406—PARTICLE TECHNOLOGY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*

Each question carries 2 *marks.*

1. What is "an Ideal screen" ?
2. Illustrate the application of jigging.
3. What are filter aids ?
4. Mention the applications of froth floatation ?
5. Define the term "Crushing Efficiency".

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

6. Explain in detail about the cumulative and differential analysis.
7. Discuss briefly about the double cone classifier with neat sketch.
8. Write in detail about the wilfley table and heavy media separation with neat sketch.
9. Describe briefly about the electrostatic precipitator with neat sketch.
10. Give a brief note on gyratory crusher with neat sketch.
11. Explain briefly about the fluid energy mill with neat sketch.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. (a) Explain in detail about the beaker decantation method and elutriation method with neat sketch.

Or

(b) Write briefly about the material balance over the screen and derive an expression for the effectiveness of the screen.

13. (a) Discuss in detail about the magnetic and high tension separation with neat sketch.

Or

(b) Describe in detail about the procedure to be followed for the design of continuous thickener.

14. (a) Give a detailed note on rotary drum filter and plate and frame filter press with neat sketch.

Or

(b) Write in detail about the top suspended centrifuge and cyclone separator with neat sketch.

15. (a) Mention the various types of crushing equipments and describe in detail about the forces acting on ball in ball mill and also derive an expression for the critical speed in a ball mill.

Or

(b) (i) Explain in detail about the storage of solids. (5 marks)

(ii) Discuss in detail about the conical ball mill mixer with neat sketch. (5 marks)

[4 × 10 = 40 marks]

C 5299 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Chemical Engineering

CH 09 405—CHEMICAL ENGINEERING THERMODYNAMICS—I

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Define partial Molar property.
2. Sketch the T_{xy} and P_{xy} diagram.
3. Write the nonrandom two-liquid (NRTL) model.
4. Define the extent of reaction.
5. State the Le Chatelier's principle.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Show that for a spontaneous process, the Gibbs energy of a system at constant pressure and temperature always gets smaller (or stays the same).
7. Develop the relationship between saturation pressure and temperature (the clapeyron equation)
8. Develop Gibbs-Duhem equations.
9. Calculate the fugacity and the fugacity of steam at 2 MPa and 500°C
10. Calculate the liquid and vapor compositions of butane (a) and n-hexane ; and (b) at 0°C and 0.5 bar. You may assume the liquid forms an ideal solution.
11. At 25°C and 1 atm, the Gibbs energy of reaction to produce liquid hydrogen peroxide (H_2O_2) from liquid water has been measured to be 116.8 kJ/mol. From this value determine the ($\Delta g^{o}f$, 298) H_2O_2.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

Each question carries 10 *marks.*

12. a) Develop an expression for the entropy change of mixing for a binary ideal gas mixture.

Or

b) Consider a binary mixture of 10 mole% chloroform (1) in acetone (2) at 333 K and 10 bar. The second virial coefficients for this system are reported to be $B_{11} = -910$, $B_{22} = -1330$, and $B_{12} = -2005$ cm^3/mol. Determine pure volume, partial volume and volume change of mixing

13. a) Develop an expression for the fugacity and fugacity coefficient of a pure species based on the Redlich-Kwong equation of state.

Or

b) A mixture of 2 moles propane (1) 3 moles butane (2) and 5 moles pentane (3) is contained at 30 bar and 200°C. The van der Waals constants for these species are :

Species	a [J m^3 mol^{-2}]	b [m^3/mol]
Propane	0.94	9.06×10^{-5}
Butane	1.45	1.22×10^{-4}
Pentane	1.91	1.45×10^{-4}

Determine the fugacity and fugacity coefficient of propane using the following approximations : the virial form of the van der Waals equation truncated to the second term

14. a) Consider the system of ethanol (1)-benzene (2) at 25°C. This mixture exhibits an azeotrope at a mole fraction of $x_1 = 0.28$ and a pressure of 122.3 torr. Determine values for the parameters in the van Laar equation. Estimate the liquid composition and pressure in equilibrium with a vapor of $y_1 = 0.75$ at 25 °C.

Details of Antoine's Equation in bar is given below,

$$P_1^{sat} = \exp\left[12.2917 - \frac{3803.98}{298.15 - 41.68}\right]$$

$$P_2^{sat} = \exp\left[9.2806 - \frac{2788.51}{298.15 - 52.36}\right]$$

Or

b) At 60 °C, ethanol (1) and ethyl acetate (2) exhibit an azeotrope at a pressure of 0.64 bar and x_1 = 0.4. You wish to use the two-suffix-Margules equation as a model for g^E. From these data, determine, as accurately as you can, the Margules parameter, A.

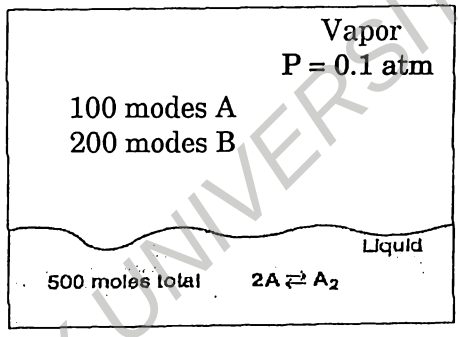
15. a) Determine the equilibrium composition of NO from air at 1 bar in the temperature range of 1100-3000 K. Plot the mole fraction of NO vs. temperature. You may assume $\Delta h_{rxn}o$ is constant for the reaction.

$$\Delta g^o_{rxn}, 298 = 173.2 \times 10^3 \left[\frac{J}{mol}\right]$$

$$\Delta h^o_{rxn}, 298 = 180.58 \times 10^3 \left[\frac{J}{mol}\right]$$

Or

b) A vessel contains a liquid and a vapor phase in equilibrium at a pressure of 0.1 atm. The vapor phase contains 100 moles of species A and 200 moles of species B. The liquid phase contains 500 total moles of species. The saturation pressure of species A is 0.1 atm and of B is 0.5 atm. Both the vapor and the liquid phases behave ideally as shown in Fig.1.



(a) Calculate the equilibrium constant for the dimerization reaction.

(b) Calculate the values for the number of moles of A, B, and A_2 in the liquid phase.

(c) A colleague maintains that the dimerization reaction does not occur in the liquid phase ; rather, he believes that the liquid phase behaves non ideally. If species A occurs only as a monomer (as A, not A_2) as he thinks, how many moles of species A would exist in the liquid phase [keep the total number of A atoms in the liquid phase the same as for part (b) ?

(d) Given your colleague's model in part (c), what value of gB is necessary for his model to fit the data ?

(4 × 10 = 40 marks)

C 5297 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

Chemical Engineering

CH 09 403—FLUID AND PARTICLE MECHANICS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Differentiate compressible and incompressible fluid.
2. Define critical Reynolds number.
3. Define Drag.
4. Define NPSH.
5. Define schedule number and BWG.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. Discuss on Newtonian and non-newtonian fluids with examples.
2. Discuss on the head losses in fittings.
3. Explain universal velocity distribution equations and its limitations.
4. Explain slurry and pneumatic transport.
5. What are schedule number and BWG ?
6. With a neat sketch explain the working of vortex shredding meter.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

1. a) At sea level the atmospheric pressure is 14.7 psia and the temperature is 70°F. Assuming that the temperature doesn't change with elevation, calculate the pressure at 1000, 5000 and 10,000 ft.

   b) With a neat sketch explain the working and principle of gravity decanter.

Or

2. Distinguish between laminar and turbulent using Reynolds experimental setup and the conclusions drawn out of the experiment.

3. a) What is meant by critical Reynolds number of a fluid flowing in a pipe and also derive Hagen Poiseuille formula for calculating viscosity of the fluid.

   b) Discuss on the relationship between friction factor and Reynolds number.

Or

4. a) Discuss about skin and form frictional losses.

   b) Exhaust gases from a power plant passes through a 15" × 20" rectangular duct at an average velocity of 50 ft/s. The total length of the duct is 250 ft and there are two 90° bends ($K_f = 0.9$). The gas is at room temperature and about 1 atm. And the properties are similar to those of air. Calculate the pressure drop in the duct and the power required to overcome the pressure losses.

5. a) What is drag force ? How is it estimated for the flow of spherical particles traveling in the stagnant fluid ?

   b) Derive Ergun's equation.

Or

6. a) Derive the settling velocity expressions for spherical particles.

   b) A hydrocarbon-air mixture is passing through a 3.5 cm diameter tube packed with 3 meters of spherical catalyst pellet of 3 mm size. The superficial velocity is 1 m/s. The fluid may be assumed be an ideal gas with a viscosity of 0.1 cP and the bed porosity is 0.4. What is the pressure drop across the bed ?

C 5296 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

B.Tech.

EN 09 402—ENVIRONMENTAL SCIENCE

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. How would environmental awareness help to protect our environment ?
2. What are aquifers ?
3. What are the biotic and abiotic components of an ecosystem ?
4. Define radioactivity.
5. What is meant by acid rain ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. What is meant by renewable and non-renewable energy resources ? List the advantages and limitations of renewable energy resources over non-renewable energy resources.
7. What is homeostatis ? What are feedback mechanisms ?
8. What are the major causes of man-wildlife conflicts ? Discuss the remedial steps that can curb the conflict.
9. With suitable examples discuss the major sources of surface and ground water pollution.
10. What are the causes, effects and control measures of thermal pollution ?
11. What is watershed ? Critically discuss the objectives and practices of watershed management.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. (a) Discuss the benefits and problems of mineral extraction with a suitable case study. What is meant by microbial leaching technique ? How is it helpful in minimizing the hazardous impacts of mining ?

Or

(b) What is soil erosion ? How is it classified ? What are the causes of soil erosion ? Explain any four soil conservation strategy.

Turn over

13. (a) Describe the process of ecological succession.

Or

(b) What is meant by in-situ and ex-situ conservation of biodiversity ? Explain with suitable example.

14. (a) What are the major sources of soil pollution ? How does soil pollution affect soil fertility ? What measures can be taken to prevent soil pollution ?

Or

(b) Give an account of the adverse effects of air pollution. Enumerate the various methods for control of air pollution.

15. (a) What do you mean by sustainable development ? What are the major measures to attain sustainability ?

Or

(b) What are greenhouse gases and greenhouse effect ? Discuss the potential and contribution of these gases to global warming phenomenon.

(4 × 10 = 40 marks)

C 5295 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2009 SCHEME] EXAMINATION, APRIL 2021

B.Tech.

EN 09/PTEN 09 401B—ENGINEERING MATHEMATICS—IV

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. Write any to properties of distribution function of the continuous random variable.
2. Define Geometric distribution.
3. What is unit step function ? Write the Z transform of unit step function.
4. What is Bessel's equation ?
5. Solve $xp + yq = 3z$.

(5 × 2 = 10 marks)

Part B

Answer any **four** *out of six*
Each question carries 5 *marks.*

6. A machine manufacturing screws is known to produce 5% defective. In a random sample of 15 screws, what is the probability that there are (i) Exactly 3 defectives ; and (ii) Not more than 3 defectives ?
7. Find $Z(n \cos n\theta)$.
8. Find the inverse Z transform of $\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$.
9. Express $J_5(x)$ interms of $J_0(x)$ and $J_1(x)$.

10. Solve $\left(x^2 - y^2 - z^2\right) p + 2xyq = 2xz$.

11. Solve $\left(p^2 + q^2\right) y = qz$.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) The savings bank account of a customer showed an average balance of Rs. 150 and a standard deviation of Rs. 50. Assuming that the account balance are normally distributed, (i) What percentage of account is over Rs. 200 ? (ii) What percentage of account is between Rs. 120 and Rs. 170 ? (iii) What percentage of account is less than Rs. 75 ?

Or

(b) The number of monthly breakdown of a computer is a random variable having Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month (i) Without a breakdown ; (ii) with only one breakdown ; and (iii) with at least one breakdown.

13. (a) Using convolution theorem, find the inverse Z transform of $\left(\frac{z}{(z-a)}\right)^3$.

Or

(b) Using Z transform, solve the difference equation $u_{n+2} - 4u_{n+1} + 3u_n = 5$.

14. (a) Find the series solution of the differential equation $\frac{d^2y}{dx^2} + xy = 0$.

Or

(b) Using method of Frobenius, obtain series solution in power of x for $x(1+x)\frac{d^2y}{dx^2} + (x+5)\frac{dy}{dx} - 4y = 0$.

15. (a) Solve $z^2 = pqxy$.

Or

(b) Using the method of separation of variables, solve $u_{xx} - u_y = 0$.

(4 × 10 = 40 marks)

FOURTH SEMESTER B.TECH. (ENGINEERING) [2009 SCHEME] DEGREE EXAMINATION, APRIL 2021

EN 09/PTEN 09 401–A—ENGINEERING MATHEMATICS—IV

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. A random variable X has pdf $f(x) = \begin{cases} ce^{-3x}, & x \geq 0 \\ 0, & x \leq 0. \end{cases}$ Find c.
2. Explain Type I and Type II errors.
3. Express $1 + x - x^2$ in terms of Legendre polynomials.
4. Solve the PDE $p^2 + q^2 = 1$.
5. Solve the PDE $z = px + qy + z\sqrt{pq}$.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

1. An under ground mine has 5 pumps installed for pumping out storm water, the probability of any one of the pumps failing during the storm is $\frac{1}{8}$. What is the probability that (i) at least 2 pumps will be working; (ii) all the pumps will be working during a particular storm ?
2. In a certain factory producing cycle tyres, there is a small chance of 1 in 500 tyres to be defective. The tyres are supplied in lots of 10. Using Poisson distribution, calculate the approximate number of lots containing no defective, one defective and two defectives tyres, respectively, in a consignment of 10000 lots.
3. Ten individuals are chosen at random from a population and their heights are found to be in inches 63, 63, 64, 65, 66, 69, 69, 70, 70, 71. Discuss the suggestion that the mean height of universe is 75. Find a reasonable range in which most of the mean height values of the ten invididuals lie ?
4. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$.

5. Solve $p(1+q) = qz$.

6. Solve the PDE $p^2 - q^2 = x - y$.

(4 × 5 = 20 marks)

Part C

Answer any **four** *questions.*
Each question carries 10 *marks.*

1. (a) In a normal distribution 7 % of the items are under 35 and 89 % are under 63. Determine mean and variance of the distribution.

   (b) An internet based company that sells discount accessories for cell phones often ships an excessive number of defective products. The company needs better control of quality. Suppose it has 20 identical car chargers on hand but that 5 are defective. If the company decides to randomly select 10 of these items, what is the probability that 2 of the 10 will be defective ?

Or

2. (a) A random variable X has a uniform distribution over (– 3, 3). Compute (i) P (X < 2) ; (ii) P(|X| < 2) ; (iii) P (|X – 2| < 2); (iv) Find k for which P(X > K) = 1/3.

   (b) If 20 % of the memory chips made in a certain plant are defective, what is the probability that in a lot of 100 randomly chosen for inspection atmost 15 will be defective. Use normal approximations.

3. Fit a binomial distribution for the following data and also test the goodness of fit (α = 5 %)

x	:	0	1	2	3	4	5
f	:	38	144	342	287	164	25

Or

4. Two random samples gave the following data :—

Sample No.		*Size*	*Mean*	*Variance*
1		8	9.6	1.2
2	...	11	16.5	2.5

Can we conclude that the two samples have been drawn from the same normal population.

5. Use Frobenius methods to solve the equation $3x\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + y = 0$.

Or

6. (a) Prove that $nP_n = (2n-1)x\,P_{n-1} - (n-1)\,P_{n-2}$.

   (b) Prove that $xP_n' = nP_n + P_{n-1}'$.

7. (a) Solve the PDE :

$$\frac{y-z}{yz}p+\frac{z-x}{zx}q=\frac{x-y}{xy}.$$

(b) Obtain the solution of the wave equation by D'Alembert's method.

Or

8. Derive the one dimensional heat equation.

(4 × 10 = 40 marks)

C 5264 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Information Technology

IT 19 405—OBJECT ORIENTED PROGRAMMING USING JAVA

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. List the advantages of object oriented programming languages over procedural languages.
2. Enumerate the features of Java.
3. Write a note on integer and float data types in Java.
4. Explain the purpose of finalize method in Java.
5. Elaborate access specifiers in Java.
6. Give an overview of static method in Java.
7. Explain the significance of interfaces in Java.
8. What is reflection API ? How are they implemented ?
9. Define Stream. Elaborate the use of Java Streams.
10. Enumerate the different states of threads in Java.
11. Explain the mechanism of Inter-thread communication in Java.
12. List and explain the methods of Applet life cycle.
13. What is JDBC ? State the components of JDBC.
14. Explain briefly about Remote Method Invocation in Java.
15. Differentiate Result Set and Rowset in JDBC.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) Explain the characteristics of object oriented languages.

Or

(b) Write a simple Java program to implement basic calculator operations.

17. (a) Define package. State the advantages of Java packages and explain how to access package from another package.

Or

(b) How strings are handled in Java ? Write a Java program to find the smallest number in the given array.

18. (a) What is inheritance ? Explain the types of inheritance in Java.

Or

(b) Develop a Java program to copy the file contents from source file to target file.

19. (a) What is multithreading ? Illustrate the ways to create multiple threads in Java.

Or

(b) Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named Compute is clicked.

20. (a) Describe the architecture of Remote Method Invocation with a neat diagram.

Or

(b) Explain the basic steps involved in the process of connecting to a database and executing a query using JDBC.

(5 × 10 = 50 marks)

C 5263 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION APRIL 2021

Information Technology

IT 19 404—OPERATING SYSTEMS

(2019 Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain operating system services to the users.
2. What is the role of system calls in an operating system ?
3. Elaborate dual mode operation of an operating system.
4. Write briefly about process creation and process termination.
5. Define Semaphore. What are counting and binary semaphores ?
6. Give technical description on thread cancellation.
7. Explain shared memory systems in Inter-process communication.
8. Differentiate Paging and Segmentation.
9. With a neat sketch, explain the process of swapping in memory management.
10. Draw and describe the file system organization.
11. Elaborate file system mounting in detail.
12. Write briefly about disk formatting in disk management.
13. State some standard methods of attackers to breach security.
14. Explain the principles of protection in detail.
15. Enumerate the differences between threat and attack.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) Describe the features of given open source operating systems :

(i) Linux.

(ii) BSD UNIX.

(iii) Solaris.

(iv) Android.

(v) iOS.

Or

(b) List all the activities of operating system in connection with process management and memory management.

17. (a) Consider the set of 4 processes whose arrival time, execution time and priority are given below :

Process	*Arrival Time*	*Execution Time*	*Priority*
P0	0	5	1
P1	1	3	2
P2	2	8	1
P3	3	6	3

Consider First Come First Serve (FCFS), Shortest Job First (SJF) and Priority scheduling algorithms. Illustrate the scheduling using Gantt chart and calculate average waiting time.

Or

(b) Outline the five characteristics suggested for comparing CPU scheduling algorithms and explain the significance of CPU scheduler, Pre-emptive scheduling and dispatcher in CPU scheduling.

18. (a) Given page reference string : 1, 2, 3, 4, 5, 1,3, 1, 6, 3, 2, 3. Compare the number of page faults for FIFO, LRU and Optimal page replacement algorithms with the frame size of 4. Also calculate the page fault ratio.

Or

(b) State the four conditions under which a deadlock situation may arise ? In what way resource allocation graphs are used for detection of deadlocks ?

19. (a) Consider a disk queue with requests for I/O to blocks on cylinders 70, 140, 50, 125, 30, 25, 160 and the initial position of read-write head is 60. What is the total head movement (in number of cylinders) incurred while servicing these requests for each of the algorithms.

(i) FCFS. (2 marks)

(ii) SSTF. (2 marks)

(iii) SCAN. (2 marks)

(iv) C-SCAN. (2 marks)

(v) LOOK. (2 marks)

Or

(b) What is the significance of free space management ? List and explain the types of implementations of free space management.

20. (a) List and explain the categories of viruses in detail.

Or

(b) Explain the architecture of Windows operating system with block diagram.

(5 × 10 = 50 marks)

C 5262 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2021

Information Technology

IT 19 403—DATA STRUCTURES AND ALGORITHMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Elaborate the analysis of running time of the algorithm to find the sum of n numbers in an array.
2. What are sparse matrices ? How it is represented using arrays ?
3. Define record. How to create and inert values into a record with example ?
4. Explain the types of double ended queues in detail.
5. How to store stack using linked list ? State the stack operations.
6. Enumerate the advantages and disadvantages of doubly linked list over singly linked list.
7. Distinguish between linear and non linear data structures.
8. Explain one way and two way threading of binary trees.
9. How to find the shortest path using Floyd's algorithm ?
10. Mention the characteristics of good hashing function and elaborate the types of hash function computing methods.
11. Define Collision. State the advantages and disadvantages of separate chaining.
12. Tabulate the differences between linear and binary search.
13. Explain the working of bubble sort algorithm and sort the given array:

    13, 32, 26, 35 and 10.
14. Explain the various factors to be considered in deciding a sorting algorithm.
15. Compare and contrast internal sorting and external sorting.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. (a) Explain asymptotic analysis of an algorithm with its notations in detail.

Or

(b) Write briefly about recursive algorithms and give the analysis of recursive algorithms with example.

17. (a) Illustrate polynomial addition and multiplication using linked list with an example.

Or

(b) Write the algorithm to convert infix expression to postfix expression using stack. Trace the algorithm to convert the infix expression 'A + (B * C – (D/E ^ F) * G) * H' to postfix expression.

18. (a) Define the following terms with appropriate sketches :

i) Tree. (2 marks)

ii) Directed Tree. (2 marks)

iii) Ordered Tree. (2 marks)

iv) Binary Tree. (2 marks)

v) Spanning Tree. (2 marks)

Or

(b) Explain preorder, inorder and postorder traversals of binary tree with suitable example.

19. (a) Discuss the types of closed hashing methods involved in collision resolution.

Or

(b) Illustrate how to search the location of value 31 using binary search with an array of given numbers - 10, 14, 19, 26, 27, 31, 33, 35, 42 and 44.

20. (a) Write the algorithm for merge sort and quick sort techniques.

Or

(b) What is Heap Sort ? Discuss the step by step procedure of heap sort with the given array of numbers - 81, 89, 9, 11, 14, 76, 54 and 22.

(5 × 10 = 50 marks)

C 5261 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Information Technology

IT 19 402—DIGITAL DATA COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Elaborate the key elements of a protocol in detail.
2. Tabulate the difference between periodic and non periodic signals.
3. Suppose the spectrum of a channel is between 5 MHz and 6 MHz and SNR_{dB} = 24 dB. Find Shannon channel capacity and the signalling levels required to achieve the capacity using Nyquist's formula ?
4. Specify the advantages and disadvantages of fiber-optic cable.
5. Explain the steps involved in block encoding technique with an example.
6. How amplitude modulation can be done in analog-to-analog conversion ?
7. What is an error ? Explain the types of errors.
8. Find pairwise Hamming distance and minimum Hamming distance of the following code words : 00000,01011, 10101, 11110.
9. Compare statistical and synchronous Time Division Multiplexing.
10. Draw and explain the addressing involved in virtual circuit network.
11. Explain the functions of flow and error control in data link layer.
12. Enumerate the types of frames and frame format in HDLC protocol.
13. How token is passed in a logical ring in controlled access ?

14. Explain Select and Poll functions used in polling access method.

15. Compare and contrast FDMA and TDMA.

(10 × 5 = 50 marks)

Part B

Answer one full section from each question.

Each question carries 10 *marks.*

16. (a) With a neat sketch, explain the different types of network topologies.

Or

(b) Describe the interaction between layers in the OSI model with diagram.

17. (a) Explain the techniques used for the conversion of analog signal to digital data.

Or

(b) Illustrate the mechanism of Amplitude Shift Keying and Frequency Shift Keying for modulating digital data into an analog signal.

18. (a) Discuss the significance of Cyclic Redundancy Check in error correction.

Or

(b) Explain two techniques used to spread the bandwidth in wireless applications.

19. (a) Draw and explain the structure of circuit switches.

Or

(b) Explain the categories of protocols involved in noiseless and noisy channels.

20. (a) Explain the methods of CSMA/CD and CSMA/CA in random access protocols.

Or

(b) Define Channelization and explain Code Division Multiple Access.

(5 × 10 = 50 marks)

C 5260 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 19 405—ANALOG CIRCUITS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain the methods to improve CMRR.
2. Briefly explain about BJT differential pair.
3. Explain the non-ideal characteristics of differential amplifier.
4. List the characteristics of an ideal op-amp.
5. Explain the working of an ideal differentiator with neat diagram.
6. Draw a neat sketch of op-amp voltage comparator and explain.
7. Design a first order active Butterworth HPF at cut off frequency of 1KHz.
8. Explain the working of switched capacitor filter.
9. Explain the working of twin tee notch filter.
10. Explain the specifications of DAC.
11. How is a current boosting performed using 7805 regulator ?
12. What are the limitations of linear voltage regulator ?
13. Draw the functional diagram of 555 timer IC.
14. Explain the lock and capture range of PLL.
15. Explain the working of frequency translator using PLL.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *question from a module.*

16. (a) Explain the large signal operation of MOS differential amplifier with neat diagram.

Or

(b) Explain the working of differential amplifier with active load.

17. (a) Explain how an op-amp can be connected as : (i) Summing amplifier ; (ii) Scaling amplifier and (iii) Averaging amplifier ?

Or

(b) Briefly explain the working of log amplifier using op-amps with neat sketches.

18. (a) Draw op-amp Wein bridge oscillator. Explain its principle of operation. Derive the condition for oscillation.

Or

(b) Explain the principle of first order low pass Butterworth filter. Write down the filter design steps with an example.

19. (a) Explain the working of R-2R DAC with an example.

Or

(b) With neat sketches explain the LM 723 Functional-diagram.

20. (a) Draw and explain the block schematic of PLL.

Or

(b) Describe the working of 555 timer based Astable Multivibrator and derive the expression for its total time period.

(5 × 10 = 50 marks)

C 5259 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 19 404—ANALOG COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What is the need for modulation ?
2. With a block diagram, explain the basic elements in a communication system.
3. What are the merits and demerits of Amplitude Modulation ?
4. What is phase modulation ?
5. Write short notes on pre-emphasis and de- emphasis.
6. List the advantages and disadvantages of Frequency Modulation.
7. Explain with block diagram tuned frequency receiver.
8. Explain any one method for detection of FM.
9. Explain PAM with necessary waveform.
10. Write short note on Ergodic processes.
11. What is meant by auto correlation function?
12. What is a continuous random variable? State its probability functions.
13. Explain the threshold effect in FM.
14. Define the following terms -(a) SNR (b) Noise equivalent bandwidth.
15. Write short note on white noise.

(10 × 5 = 50 marks)

Part B

Answer any **one** *question from a module*

Each question carries 10 *marks.*

16. (A) Explain AM DSB FC modulated wave with necessary equations and spectrum.

Or

(B) Explain high level and low- level AM transmitters.

17. (A) Derive the mathematical expression for a Frequency Modulated wave.

Or

(B) Explain the Foster Seeley discriminator for FM demodulation and show the output phasor diagrams for different input frequencies.

18. (A) Explain the operation of a super heterodyne receiver with the block diagram.

Or

(B) Explain the generation and detection of PPM signal with neat waveforms.

19. (A) Explain in detail about random variables, probability models and statistical averages.

Or

(B) Explain in detail about Gaussian processes and its properties.

20. (A) Discuss different types of noise.

Or

(B) Write short notes on envelope detection and threshold function.

(5 × 10 = 50 marks)

C 5258 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 19 403—MICROPROCESSOR AND MICROCONTROLLER

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Give the features of a RISC machine.
2. What are the functions of BIU in 8086 ? Draw a functional block diagram of BIU.
3. With an example, explain the function of a stack.
4. What is an interrupt ? List few interrupts in 8086 with its uses.
5. Distinguish between call and jump instructions.
6. List the control signals required for I/O interfacing and explain each.
7. List out the features of 8251.
8. Which IC is used as DMA controller ? List few features of that IC.
9. Explain the basic principle of serial communication with neat diagram.
10. Explain the use of each bit of TCON register.
11. List few logical instructions of 8051 with necessary examples.
12. Differentiate between microcontrollers and microprocessors.
13. Explain the use of each bit in SCON register.
14. How is a DIP switch interfaced with 8051 ?
15. Explain the importance of TI flag for serial communication in 8051.

(10 × 5 = 50 marks)

Part B

Answer any **one** *question from a module.*

16. A) Explain the internal architecture of 8086.

Or

B) Explain memory segmentation in 8086 and how they are addressed.

17. A) Explain the data transfer and arithmetic instructions of 8086 with examples.

Or

B) Write an assembly language program to check if a number is odd or even. If odd, find the square of the number. If even, divide the number by 2 and find quotient.

18. A) Explain with necessary diagrams the interfacing of 8086 with 8255.

Or

B) Explain the internal block diagram of 8253 programmable timer.

19. A) Draw the pin diagram of 8051 and explain the functions of each pin.

Or

B) Explain the memory organization of 8051.

20. A) Write an assembly language program to transfer the message 'YES' serially at 9600 baud rate, 8 bit data, 1 stop bit. Do this continuously.

Or

B) Explain how DAC can be interfaced with 8051. Write an example assembly language program to demonstrate the same.

(5 × 10 = 50 marks)

C 5257 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Electronics and Communication Engineering

EC 19 402—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

1. Find whether the following signals are periodic or not. If periodic find the period :
   $x(t) = \cos 60\pi t + \sin 50\pi t$.
2. What is a signal ? Define deterministic and random signals.
3. Define causal systems. Check whether the given system is causal or not $y(n) = x(n) + \frac{1}{x(n-1)}$.
4. Explain ESD and PSD of signal.
5. Write the condition for the existence of Fourier transform.
6. Explain sampling theorem and aliasing.
7. Explain the linearity and time shifting property of Laplace transform.
8. Find the inverse Laplace transform of $X(s) = \frac{1}{s(s+2)}$.
9. Find whether the following systems with impulse response $h(t)$ is stable or not $h(t) = e^{-2|t|}$.
10. Find the discrete time Fourier transform of the given signal $x(n) = \{1, -1, 2, 2\}$.
11. Explain the linearity and time shifting properties of DTFT.
12. State and prove differentiation property of DTFT.
13. Derive the relation between z transform and DTFT.
14. How can we determine the stability of the system using z transform ?
15. Determine the relationship between s-plane and z-plane.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full question from each section.*
Each carries 10 *marks.*

16. (a) What is a signal ? Explain in detail about the classification of signals.

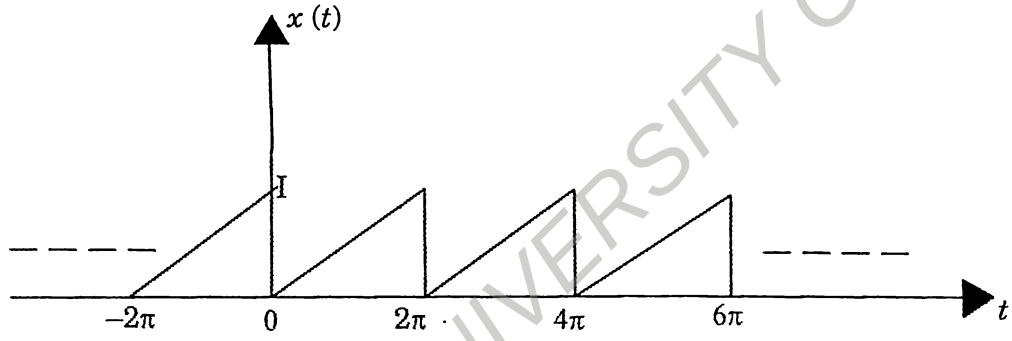
Or

(b) Determine whether the system given below is dynamic, non-linear, causal and time-invariant $y(n) = x(n)\, x(n-1)$.

17. (a) Explain the properties of continuous time Fourier series.

Or

(b) Find the cosine representation Fourier series for the signal shown in figure below :



18. (a) For a system with transfer function $H(s) = \dfrac{s+5}{s^2+5s+6}$ find the zero-state response when the input $x(t)$ is $e^{-3t}\, u(t)$.

Or

(b) By using Laplace transform, solve the LTI system characterized by the differential equation $\dfrac{d^2 y(t)}{dt} + 3\dfrac{dy(t)}{dt} + 2y(t) = \dfrac{d}{dt}x(t)$. If $y(0^-) = 2$; $\dfrac{dy(0^-)}{dt} = 1$ and $x(t) = e^{-t}\, u(t)$.

19. (a) Explain the properties of Discrete Time Fourier transform.

Or

(b) Find the convolution of the signals given below using Fourier transform.

$$x_1(n) = \left(\frac{1}{2}\right)^n u(n) ; x_2(n) = \left(\frac{1}{3}\right)^n u(n).$$

20. (a) Find the inverse of z-transform of :

$$X(z) = \frac{\frac{1}{4}z^{-1}}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)} \text{ ROC } : |z| > \frac{1}{2}.$$

Or

(b) Consider the system $H(z) = \frac{0.2z}{(z+0.4)(z-0.2)}$ ROC : $|z| > 0.4$.

(i) Find the impulse response function of the system.

(ii) Why does the DTFT exits for the system ?

(iii) Find the DTFT.

(5 × 10 = 50 marks)

C 5256 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 19 405—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 10 *marks.*

I. 1 Classify the signals with examples for each.

2 Distinguish between continuous time signal and discrete time signal

3 Determine, whether the systems described i/p and o/p equations are causal and linear

$y_1(t) = x(t-3) + (3-t)$

4 List out any three properties of continuous time trigonometric Fourier series.

5 Obtain Fourier Series Co-efficients for $x(n) = \sin w_0 n$

6 What are the Dirichlet's conditions of Fourier series ?

7 Write down the convolution integral to find the output of the CT systems

8 Determine the Laplace transform of the signal $f(t-5)$ and $u(t-5)$.

9 Compare and contrast between Laplace transforms and Fourier transforms

10 State the sufficient condition for the existence of DTFT for an aperiodic sequence ?

11 Find DTFT of $u(n)$.

12 State Parseval's relation for discrete time aperiodic signals.

13 State and prove the linearity property of Z transform.

14 Define unilateral and bilateral Z transform.

15 Determine the Z Transform of the Signal $x(n) = \{1, 2, 3, 2\}$.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **five** *questions.*
Each question carries 10 *marks.*

II. 1 Determine the power and RMS value of the following signals :

$(t) = 5 \cos (50t + \pi/3)$
$(t) = 10 \cos 5t \cos 10t.$

Or

2 Determine whether the following system are time invariant or not.

$y(t) = t\, x(t)$
$(n) = (2n).$

3 i) Distinguish between Fourier series Analysis and Fourier Transforms

ii) Obtain Fourier series of half wave Rectified Sine wave.

Or

4 i) Find the Laplace Transform and ROC of the signal $(t) = e - atu(t) + e - btu(t)$

ii) State and Prove Convolution property and parseval's relation of Fourier series

5 The system produces the output $y(t) = e - tu(t)$ for an input $x(t) = e - 2tu(t)$. Determine i) frequency response ; and ii) Magnitude and phase of the response

Or

6 Using Laplace transform, find the impulse response of an LTI system described by the differential equation :

$$\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t).$$

7 Determine the DTFT of $(1/2)^n\ u(n)$. Plot its spectrum.

Or

8 Prove the sampling theorem and explain how the original signal can be reconstructed from the sampled version.

9 Find the inverse Z Transform of $X(z) = 1/(1 - 0.5\,z - 1 + 0.5\,z - 2)$ for ROC $|Z| > 1$.

Or

10 Find the inverse z-transform of : $X(z) = (1/1 + 2z) + (2z/z - 0.25)$.

(5 × 10 = 50 marks)

C 5255 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 19 404—DIGITAL ELECTRONICS AND LOGIC CIRCUITS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

I. 1 Convert :

(a) (53.625)10 to its binary equivalent.

(b) (101111.1101)2 to its decimal equivalent.

2 Determine one's complement of $=(2718)_{16}$.

3 Convert 12116 into its binary and binary coded decimal equivalent.

4 Simplify the given Boolean Expression $F = x' + xy + xz' + xy'z'$.

5 Explain briefly about SOP and POS forms with example.

6 Define encoder and decoder with its block diagram.

7 Show how the JK flip-flop can be modified into a D flip-flop or a T flip-flop.

8 What is a self-starting counter ?

9 Give the characteristic equation and state diagram of T flip-flop.

10 What is meant by memory expansion ? Mention its limit.

11 Implement the Exclusive-OR function using PROM.

12 Outline about PL A.

13 Explain timer and interrupts of microprocessor 8085.

14 Mention the addressing modes of microprocessor 8085.

15 Write a program to subtract two numbers.

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

II. 1 Give the truth tables of the following logic gates :

(i) OR ; (ii) NOR ; (iii) AND ; (iv) NAND ; (v) NOT and (vi) EXOR.

Or

2 (a) Convert : (i) 10010011101111012 and (ii) 10011101011.001011102 to hexadecimal.

(b) Convert to Excess -3 code : (a) 643 and (b) 234.

3 (i) State and prove De-Morgan's theorem.

(ii) Simplify the following Boolean expression using K- map :

$f(x, y, z) = x\,y'z' + xyz + xyz' + x\,y'\,z + xyz'$ $f(A, B, C, D) = \sum(1,3,4,5,9,10,11) + \sum(6, 8)$.

Or

4 Design a full adder using 4X1 multiplexer ; also write its truth table and logical diagram.

5 Using JK flip-flops, design a synchronous counter which counts in the sequence,

000,001,010,011,100,101,110,111,000.

Or

6 Draw the logic diagram for a 5- bit serial load shift register using D FF and explain.

7 Write short note on RAM, types of ROMs.

Or

8 Implement the following function using :

PLA F1 = Ó (2, 4, 5, 10, 12, 13, 14) and F2 = Ó (2, 9, 10, 11, 13, 14, 15).

9 Construct the architecture of 8085 with neat sketch.

Or

10 Discuss the instruction sets of microprocessor 8085.

(5 × 10 = 50 marks)

C 5254 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 19 403—ELECTRICAL MACHINES—I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

I. 1 What are the various methods of improving commutation ?

2 Compare simplex lap winding and wave winding.

3 Explain the necessity of inter-poles ?

4 Classify and give the applications of D.C. generators.

5 Give the necessity of parallel operation of generators.

6 Define critical resistance in case of D.C. series generator.

7 Outline the significance of back e.m.f. ?

8 Write any *two* advantages and two disadvantages of Brake test.

9 Obtain the condition for maximum efficiency.

10 State and explain the significance of voltage regulation.

11 Differentiate the on load and off load tap changing.

12 Explain the principle of operation of transformer.

13 Explain the factors involved in the choice of specific magnetic loading.

14 Derive the output equation of single phase transformer.

15 Distinguish stacking factor and window space factor.

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

Each question carries 10 *marks.*

II. 1 What is armature reaction ? Discuss the effects of armature reaction in detail.

Or

2 Make use of the diagram explain the construction of D.C. machine.

3 List the types of D.C. generators. Explain the internal and external characteristics of them with neat diagrams and e.m.f. equations ?

Or

4 In a D.C. generator fluxes are directly proportional to 1.2 times field current. The generator is working at a speed of 200 r.p.m. and flux per pole is 30 mWb. If the generator is lap wounded with 600 conductors in series, find the e.m.f. generated. If the winding is wave wound, find the change in excitation current to obtain the same voltage as above. Number of poles in machine are 6.

5 State the necessity of the starter. With neat diagram explain the construction and working of a 3 point starter ?

Or

6 The Hopkinson test on two similar d.c. shunt machines gave the following results : Line voltage : 220 V; Line current excluding filed current : 40 A ; Armature current of motoring machine: 200 A ; field currents are 6 A and 7 A. Calculate the efficiency of each of the machine at the given load conduction. The armature resistance of each machine is 0.05 Ω.

7 Explain the operation of a transformer with neat phasor diagram when at no load and on load condition.

Or

8 Obtain the equivalent circuit of a 200/400 V, 50 Hz, single phase transformer from the following test data :

OC test : 200 V, 0.7 A, 70 W on LV side.

SC test : 15 V, 10 A, 85 W on HV side.

9 A design is required for a 50 kW, 4pole, 600rpm, and 220 V d.c. shunt generator. The average flux density in the air gap and specific electric loading are respectively 0.57 T and 30000 ampere-conductors per metre. Calculate suitable dimensions of armature core to lead to a square pole face. Assume that full load armature drop is 3 % of the rated voltage and the field current is 1 % of rated full load current. Ratio pole arc to pole pitch is 0.67. Determine also the number of armature conductors and slots.

Or

10. Calculate the overall dimensions of the core and window for a 200 kVA, 6600/400V, 50 Hz, Three phase core type, oil immersed, self-cooled transformer. Assume: Flux density = 1.3 T, Current density = 2.5 A/mm^2, Window space factor = 0.3, Volt / turn = 10 V, type of core : Cruciform, overall height = 3 overall width. Stacking factor = 0.9.Use 3 stepped core. For three stepped core width of largest stamping = 09 d and net iron area = 0.6d2 where d is the diameter of circumscribing circle. Also calculate the number of turns and cross-sectional area of the conductors used for the primary and secondary windings.

(5 × 10 = 50 marks)

C 5253 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Electrical and Electronics Engineering

EE 19 402—ELECTROMAGNETIC FIELD THEORY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 Give any *three* co-ordinate systems.

2 How is the unit vectors defined in three co-ordinate systems ?

3 Describe the source of electric field and magnetic fields.

4 Obtain the relation between electric field intensity and electric flux density.

5 Distinguish between series and parallel circuits.

6 Write the relation between relative permeability and susceptibility.

7 Express the self and mutual inductance.

8 Define Faraday's law of induction with an example.

9 In a material for which = 5 s/m. and r = 1 and E = 250 sin 1010t (V/m) find the conduction and displacement current densities.

10 Write Maxwell's equation in point and integral form for good conductors.

11 Explain the properties of uniform plane wave.

12 Outline electromagnetic spectrum.

13 What are Helmholtz equations of electromagnetic wave in the phasor form ?

14 Define linear, elliptical and circular polarization.

15 Illustrate the wave characteristics on infinite transmission lines.

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

Each question carries 10 *marks.*

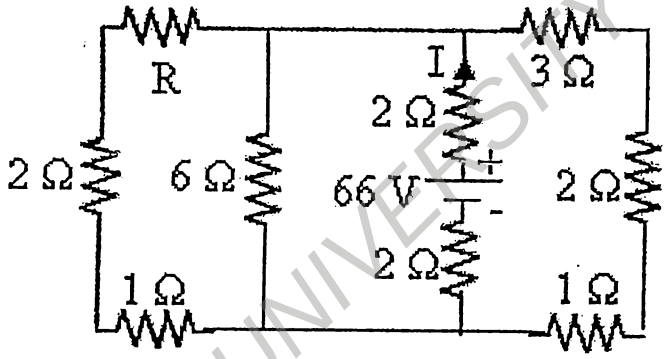
II. (1) (a) Define divergence, gradient, curl in spherical co-ordinate system with mathematical expression.

(b) Prove that divergence of a curl of a vector is zero, using Stoke's theorem.

Or

(2) Derive the boundary conditions of the normal and tangential components of electric field at the inter face of two media with different dielectrics.

(3) Find the value of resistance R, if the current is I = 11 A and source voltage is 66 V as shown in figure :



Or

(4) From the Biot-Savart's law, write the expression for magnetic field intensity at a point P and distance R from the infinitely long straight current carrying conductor.

(5) (i) Wrie short notes on Faradays law of electromagnetic induction.

(ii) In a material for which = 5 s/m. and $r = 1$ and E = 250 sin 1010t (V/m), find the conduction and displacement current densities.

Or

(6) Show that the ratio of the amplitudes of the conduction current density and displacement current density is , for the applied field amplitude ratio if the applied field is E = Em $e - t/$ where is real.

(7) Derive General field relation for time varying electric and magnetic fields using Maxwell's equations.

Or

(8) Briefly explain about the wave incident (i) Normally on perfect conductor ; (ii) Obliquely to the surface of perfect conductor.

(9) A uniform plane wave of 200 MHz, traveling in free space Impinges normally on a large block of material having r = 4, μr = 9 and = 0. Calculate transmission and reflection co-efficient of interface.

Or

(10) Derive the expression for total magnetic field when a vertically polarized wave is incident obliquely on a perfect conductor.

(5 × 10 = 50 marks)

C 5252 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Printing Technology

PT 19 405—ELECTRICAL DRIVES AND CONTROL

(2019 Scheme)

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

1. Explain in detail about the series connection of SCRs.
2. What are the main specifications and ratings of SCR to be considered while designing ? Explain.
3. Explain in detail the two transistor analogy of SCR.
4. Explain the working operation of 1-phase AC voltage controller with resistive load with output waveforms.
5. List out the applications of cyclo converters.
6. Derive the expression for output voltage and output current of AC voltage controller with RL load.
7. What is the time ratio control in DC choppers ?
8. Explain in detail about the class C chopper.
9. Explain in detail about the class D chopper.
10. What is the role of load equalization in the performance of an electric drive?
11. Explain the nature and classification of load torques of an electric drive system.
12. Discuss the different modes of operation of an electrical drive.
13. Why stator voltage control is an inefficient method of induction motor speed control ?
14. Why VVVF method of speed control of a three-phase induction motor is preferable to the frequency control method ?
15. Name the type of induction motor which produces highest starting torque ?

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*

16. (a) Give the constructional details of SCR with the help of schematic diagram and circuit symbol.

Or

(b) Explain in detail about the TURN-ON and TURN-OFF methods of SCR.

17. (a) Explain the operation of a single-phase bridge type step down cyclo converter with the help of circuit diagram and waveforms.

Or

(b) Describe the operation of a single-phase AC voltage controller with a neat circuit diagram and output waveforms with respect to source voltage waveforms at $\alpha = 60°$ for R-load.

18. (a) Explain the chopper control techniques for each of a separately excited d.c. motor and d.c. series motor.

Or

(b) Explain the operation of a step down chopper with RL load. Derive the necessary output voltage and current expressions.

19. (a) What are the advantages of dual converters in electric drives ?

Or

(b) Explain the process of load equalization.

20. (a) Draw and explain the speed-torque characteristics curve of 3-phase induction motor.

Or

(b) Explain how the acceleration time and energy losses are calculated during starting of a three-phase induction motor.

($5 \times 10 = 50$ marks)

C 5251 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2021

Printing Technology

PT 19 404—PRINTING MATERIAL SCIENCE

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Write notes on coagulation of colloids.
2. What are the applications of gum Arabic in printing industry ? Explain.
3. Discuss the features of diazo compounds and photopolymers.
4. Discuss the preparation and properties of photopolymer letterpress plates.
5. Explain the properties and applications of thikol rubber.
6. Discuss the features and applications of Fish glue and egg albumin in printing industry.
7. Differentiate lacquer and varnish. Discuss their ingredients.
8. What are the different types of solvents used in printing ink ? Explain their features.
9. Explain various ingredients of a printing ink along with their features and purpose.
10. What are the features of label paper and packing papers ?
11. What are the features of publishing papers and commercial papers ?
12. Compare the features of solid bleached sulphate board and coated unbleached board with neat sketches.
13. Write notes on structure and working of an offset plate.
14. Discuss the applications of various metals as printing substrates.
15. Explain the features and applications of copper and tin in printing industry.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **all** *questions.*
Each question carries 10 *marks.*

16. Discuss the application of colloids in printing industry.

Or

17. What are the different purification methods of colloids ? Explain.

18. Explain the manufacturing, properties and uses of polystyrenes in printing industry.

Or

19. Discuss various condensation polymers and their uses in printing industry.

20. Discuss various types of pigments along with its properties.

Or

21. Discuss various types of resins and solvents used in printing ink.

22. Discuss various properties required for paper to be used for web offset printing.

Or

23. Discuss various types of paper substrates.

24. Explain various tests done on plastic substrates used for printing.

Or

25. Discuss various chemical and physical properties of offset plates.

(5 × 10 = 50 marks)

C 5250 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Printing Technology

PT 19 403—STRENGTH OF MATERIAL

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. What are the advantages of compass surveying ? Name any *two* compass that can be used for such surveying.
2. Discuss the composition of cement.
3. What is meant by "bearing capacity of soil" ? List the two types of bearing capacity of soil.
4. Define the following : yield stress and ultimate stress.
5. What is Mohr's circle of stress ? Write the steps involved in construction of it.
6. Prove that $E = 3K\left(1 - \frac{2}{m}\right)$, where E is the modulus of elasticity, K is the bulk modulus and 1/m is the Poisson's ratio.
7. Discuss the concepts of Bending moment and Shear force.
8. Find the Young's modulus of a brass rod of diameter 35mm and of length 275 mm. which is subjected to a tensile load of 15 kN, when the extension of the rod is equal to 0.4 mm.
9. Derive an equation for change in total length for a bar of varying cross-section which is non-prismatic. Assume the bar to have three different cross-sections with different lengths.
10. What do you mean by section modulus ? Find an expression for section modulus for a circular section.
11. Develop the governing differential equation of beams.
12. Explain the conjugate beam method.
13. Define slenderness ratio of a column and discuss its significance.

14. Discuss the limitations of Euler's buckling theory.

15. What is slenderness ratio? How does it influence the load carrying capacity of a column ?

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*

Each question carries 10 *marks.*

16. What is chain surveying ? List the uses of various instruments used in the same.

Or

17. Explain the different types of errors in surveying.

(10 marks)

18. A bar 600 mm. long and having rectangular cross-section 150 mm. × 75 mm. is subjected to an axial tensile load of 120 kN and lateral compressive load of 300 kN on face 600 mm. × 50 mm. It is observed that the change in length = 0.08 mm and change in dimension of 150 mm. is 0.008 mm. Find the value of Young's modulus and Poisson's ratio.

Or

19. A flat bar of rectangular cross-section, constant thickness "t" and length "L" is subjected to an axial tensile force P. The width of the bar varies linearly from b_1 at the left end to b_2 at the right end. Derive a formula for the elongation "δL" of the bar. Calculate the elongation when b_1 = 50 mm, b_2 = 100 mm, L = 500 mm, E = 200 Gpa and P = 35 kN.

(10 marks)

20. For the beam shown in Figure. 1, draw the SFD and BMD. Determine maximum BM and SF. Obtain points of contraflexure if any.

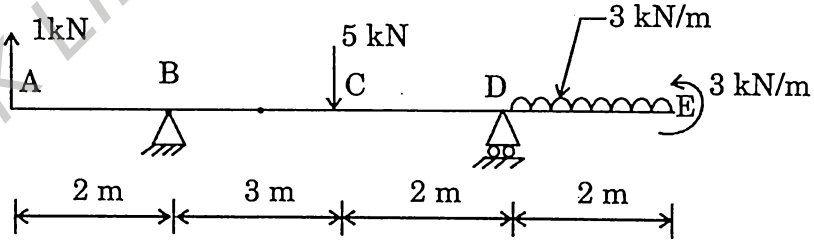


Figure 1

Or

21. State the assumptions in theory of simple bending. Derive the bending equation.

(10 marks)

22. A cantilever 15 cm. wide and 20 cm. deep projects 1.5 m. out of a wall and carries a point load of 50 kN at the free end. Find the slope and deflection of the cantilever at the free end. Take E = 210 GPa.

Or

23. A simply supported beam is loaded as shown in Figure 2. Determine the deflection at points C and D in the beam. Take E = 200 Gpa and I = 20000 cm^4.

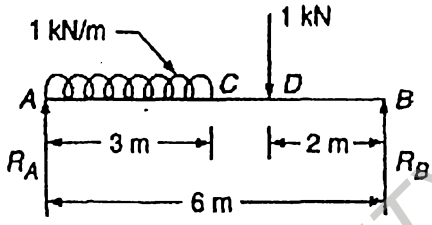


Figure 2

(10 marks)

24. Design a solid shaft to transmit 48 kW power at 120 r.p.m. Maximum torque exceeds the mean torque by 20 %. Assume the permissible shear stress in the shaft material as 80 MPa. Design a hollow shaft to replace the above shaft. Take internal diameter as 0.8 times the external diameter. Also find the percentage saving in the material of shaft.

Or

25. A thin cylinder 75 mm. internal diameter is 250 mm. long with wall thickness 2.5 mm. It is subjected to an internal pressure of 7 MPa. Determine the change in diameter, change in length and the stress developed.

(10 marks)

[5 × 10 = 50 marks]

C 5249 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2021

Printing Technology

PT 19 402—OFFSET TECHNOLOGY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain the parts of the feeder unit on a sheet-fed offset press with neat diagram.
2. Explain the common impression cylinder press with neat diagram.
3. Explain the offset lithography principle using 3 cylinder design. Draw a neat diagram.
4. Explain the working of double sheet detector with a neat diagram.
5. What are the two types of side lays ? Explain with diagrams.
6. Describe the impression cylinder of an offset press.
7. Explain the significant of use of alcohol in dampening solution.
8. What is the difference between continuous dampening and intermittent dampening ? Discuss.
9. What is a plate feed dampening system ? Describe with neat diagram.
10. What is intermittent inking in offset printing ? Explain.
11. Explain the procedure of ink fountain setting.
12. Explain the significance of color sequence in multicolour offset printing.
13. How does the quickset ink dry on paper ? Explain.
14. What is double former fold ? Brief.
15. Explain the principle of stroboscope.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **all** *questions.*
Each question carries 10 *marks.*

16. Describe the construction of Plate cylinder, blanket cylinder and impression cylinder with neat sketches.

Or

17. Discuss the multicolour sheet-fed offset press with neat diagram.

18. Discuss the mechanisms of mechanical, electromechanical and pneumatic type of sheet detectors used on sheet-fed offset press.

Or

19. What are the different transfer systems used for sheet transfer from one color unit to other and to the delivery unit ? Describe each of them.

20. What are the ingredients of dampening solution? Explain with their functions.

Or

21. Explain brush dampening and spray dampening systems with neat diagrams.

22. What are the different types of blankets used in offset printing ? Explain in detail. Give an account of blanket thickness and hardness.

Or

23. Define the printing problem, mention the cause of the problem and give solutions to such print problems :

    a) Misregistration ; b) Dot loss ; c) Blistering ; and d) Plate Image Blinding

24. Describe the principles of single and multi-roll stand used on web offset press with neat diagrams.

Or

25. Explain the dancer roll system for tension control. Describe the dancer roll construction and working principle.

(5 × 10 = 50 marks)

C 5248 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 19 405—MANUFACTURING PROCESS—I

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. List the main advantages of the casting process.
2. Briefly explain the procedure to be followed for making sand mold.
3. What is draft allowance ? How is it provided for patterns ?
4. What is meant by carbon dioxide (Co_2) moulding ? State the disadvantages of Co_2 moulding.
5. Differentiate between welding, brazing and soldering processes.
6. Outline the investment casting process giving typical applicants of the process.
7. Explain about squeeze casting in detail with a neat diagram
8. Explain the flame characteristics of gas welding process with neat sketch.
9. What is flux ? Why is it essential to use it in some welding situations ?
10. Explain briefly the procedure of manual metal arc-welding process.
11. Discuss the basic principle of diffusion bonding with a neat sketch.
12. Explain about the inspection and testing methods of welding joints.
13. List out its advantages and disadvantages of gas welding.
14. Briefly explain Thermite welding.
15. Explain EBW with a neat sketch.

(10 × 5 = 50 marks)

Part B

Answer any **one** *question from a module.*

Each question carries 10 *marks.*

16. Sketch different types of cores used in foundry practice.

Or

17. What is pattern ? List different types of pattern. Explain match plate pattern with a neat sketch.

18. Figuratively explain in detail about shell molding process.

Or

19. Explain investment casting with the aid of neat sketch. Also write its advantages and disadvantages.

20. Discuss the various welding defects with neat sketches

Or

21. With neat labelled sketch explain Plasma Arc Welding. Write its advantages and disadvantages.

22. With suitable sketch explain the process of TIG welding. What are its disadvantages ?

Or

23. Explain Electron Beam Welding with neat labelled sketch. Mention some applications.

24. What are the different joint designs in adhesive bonding ? Explain how a good joint design can be selected ?

Or

25. Explain any *three* types of brazing processes with neat sketches.

(5 × 10 = 50 marks]

C 5247 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 19 404—HYDRAULIC MACHINERY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Brief on impulse momentum equation.
2. Explain the concept of force exerted by jet on a stationary plate.
3. Find the propelling force acting on a ship which takes water through inlet orifices which are at right angles to the direction of motion of ship, and discharge at the back through orifices having effective areas of 0.04 m^2. the water is flowing at the rate of 1000 liters/s and ship is moving with a velocity of 8 m/s.
4. Brief on hydraulic efficiency of turbine.
5. Two jets strike the buckets of a Pelton wheel, which is having shaft power as 15450 kW. The diameter of each jet is given as 200 mm. If the net head on the turbine is 400 m, find the overall efficiency of the turbine. Take C_v = 1.0.
6. Define the following : (i) Speed ratio ; (ii) Flow ratio ; and (iii) Discharge of turbine.
7. Brief on Mechanical efficiency and overall efficiency of centrifugal pump.
8. What is multi-stage centrifugal pump ? Give its significance.
9. Explain on priming of centrifugal pump.
10. List any *three* dimensionless numbers with their significance.
11. Define cavitation in fluid machinery.
12. Differentiate between geometric similarity and kinematic similarity.

13. Define slip of reciprocating pump.

14. What are air vessels ? Mention its significances.

15. A hydraulic press has a ram of 200 mm diameter and a plunger of 30 mm diameter. It is used for lifting a weight of 3 KN. Find the force required at the plunger.

(10 × 5 = 50 marks)

Part B

Each question carries 10 marks.

16. A free jet of water of area A and velocity V strikes a vertical plate normally. The plate is moving with a velocity u in the direction of the jet. Obtain the value of the ratio u/V for maximum efficiency of this power transmission system. What is the value of corresponding maximum efficiency ?

Or

17. A 10 cm diameter jet of water strikes a curved vane with a velocity of 25 m/s. The inlet angle of the vane is zero and the outlet angle is 150° measured with respect to the impinging jet direction. Determine the resultant force on the vane : (a) When the vane is stationary ; and (b) when the vane is moving in the direction of the jet at 10 m/s velocity.

18. A 1/5 scale model of a Kaplan turbine is designed to operate at a head of 25 m. The prototype produces 18.50 MW of power under a head of 49 m when operating at a speed of 250 rpm. Find the speed, discharge and power of the model. Assume the efficiency of the model and prototype is the same at a value of 88%.

Or

19. A scale model of a 5 MW turbine working at 100 m head and having an operating speed of 500 rpm is desired. The model head is restricted to 5.0 m and the model discharge is restricted to 0.5 m^3/s. Calculate the scale ratio of the biggest sized model, its speed and power produced by the model. Assume the efficiency of the model and prototype to be the same at a value of 90%.

20. Explain in detail the characteristics curves of centrifugal pumps.

Or

21. A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 r.p.m against a head of 25m. the impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.

22. The pressure difference Δp in a pipe of diameter D and length l due to viscous flow depends on the velocity V, viscosity μ, density ρ using Buckingham Pi theorem, obtain an expression for Δp.

Or

23. Explain in detail any five dimensionless numbers with its applications.

24. With a neat sketch, elaborate on the principle and construction of reciprocating pump.

Or

25. A single-acting reciprocating pump has a 15 cm diameter piston with a crank of 15 cm radius. The delivery pipe is of 10 cm diameter. At a speed of 60 rpm, a discharge of 310 litres/ minute of water is lifted to a total height of 15 m. Find the slip, coefficient of discharge and theoretical power in kW required to drive the pump.

(5 × 10 = 50 marks)

C 5246 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 19 403—THERMODYNAMICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Define the following : (i) System ; (ii) Process ; (iii) Surroundings.
2. Differentiate between closed system and open system.
3. What are intensive and extensive properties ?
4. A system consisting of some fluid is stirred in a tank. The rate of work done on the system by the stirrer is 2.25 hp. The heat generated due to stirring is dissipated to the surroundings. If the heat transferred to the surroundings is 3400 kj/h, Determine the change in internal energy.
5. Calculate ΔU and ΔH in kJ for 1 kmol water, as it is vaporised at the constant temperature of 373 K and constant Pressure of 101.3 kPa. The specific volumes of liquid and vapour at these conditions are 1.04×10^{-3} and 1.675 m^3/ kmol respectively ; 1030 kJ of heat is added to water for this change.
6. Prove internal energy is a state function.
7. A heat engine operates between a heat source at 700 K and a heat sink at 300 K. What is the maximum efficiency of the engine ?
8. Differentiate between heat and work.
9. State the second law of thermodynamics.
10. Assuming air to behave as an ideal gas, calculate the molar volume of air at 350 K and 1 bar.
11. Brief on the equation of state.
12. One kilo mol CO_2 occupies a volume of 0.381m^3 at 313 K. Compare the pressure given by :(i) Ideal gas equation ; (ii) Van der waals equation (take a = 0.365 Nm^4/mol^2 and $b = 4.28 \times 10^{-5}$ m^3/mol.

Turn over

13. State Daltons law of partial pressures.

14. Brief on fundamental property relations.

15. What is Joule Thomson coefficient, how throttling process is treated as adiabatic operation ?

(10 × 5 = 50 marks)

Part B

Answer **all** *questions.*
Each question carries 10 *marks.*

16. Explain any three temperature measuring instruments with neat sketch.

Or

17. A special manometer fluid has a sp.gr of 2.95 and is used to measure a pressure of 1.15 bar at a location where the barometric pressure is 760 mm. of Hg. What height will the manometric fluid indicate ?

18. Water at 368 K is pumped from a storage tank at the rate of $25 m^3/h$. The motor for the pump supplies work at the rate of 2 hp. The water passes through a heat exchanger, where it gives up heat at the rate of 42000 kJ/min and is delivered to a second storage tank at an elevation of 20 m. above the first tank. What is the temperature of the water delivered to the second storage tank ? Assume that the enthalpy of water is 0 at 273 K and the specific heat of water is constant at 4.2 kJ/ kg.K.

Or

19. Heat is transferred to 10 kg. of air which is initially at 100 kPa at 300 K until its temperature reaches 600 K. Determine the change internal energy, change in enthalpy, the heat supplied and the work done in the constant volume and constant pressure process. Assume air is ideal gas for which the PVT relationship is PV = n RT, R = 8.314 kJ/kmol.K, Cp = 29.099 kJ/kmol.K, Cv = 20.785 kJ/kmol.K, Mw of air = 29.

20. (i) State and prove clausius inequality

(ii) One kilogram of superheated steam at 1.5 MPa and 523K (H = 2923.5 kJ/kg, S = 6.71 kJ/kg.K) is contained in a piston cylinder assembly. The unit is kept at ambient conditions of 300K and the steam condenses to saturation liquid (H = 845kJ/kg, S = 2.32 kJ/kg.K) at constant pressure. Calculate the change in entropy and check whether the process is reversible or not.

Or

21. Oil at 500 K is to be cooled at a rate of 5000 kg/h in a counter current exchanger using cold water available at 295 K. A temperature approach of 10 K is to be maintained at both ends of the exchanger. The specific heats of oil and water are respectively 3.2 and 4.2 kJ/kg. K. Determine the total entropy change in the process.

22. Explain the following : (i) Compressibility factor ; (ii) Law of corresponding states ; and (ii) virial equation.

Or

23. Explain with neat sketch the pressure - temperature curve diagram for a pure material.

24. Obtain equation for Maxwell's relation.

Or

25. Derive an expression for Gibbs - Helmholtz Equation.

(5 × 10 = 50 marks)

C 5245 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2021

Mechanical Engineering

ME 19 402—COMPUTER PROGRAMMING IN C

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Elaborate two kinds of memory in a computer system.
2. List and explain various input devices of a computer system.
3. Draw a flow chart to find the largest of three numbers A, B and C.
4. Define Macros. What are the advantages and disadvantages of Macros ?
5. Differentiate global and local variables in C.
6. Explain the constructs for loop operations in C.
7. Define an array. How to declare and initialize two-dimensional array ?
8. Write a C program to find the number of vowels and consonants in a text string.
9. Explain declaration and initialization of array of strings.
10. Write a C program to find the factorial of a given number using recursion.
11. What are the benefits of pointers? How pointer variables are declared and initialised?
12. Write a C program to check whether the given integer is palindrome or not using functions.
13. For solving a linear system, compare Gauss elimination method and Gauss Jordan method.
14. Solve the linear system $x + y = 2$ and $2x + 3y = 5$ by Gauss-Jordan method.
15. Find the first iteration value of the given equations $4x + y = 8$ and $2x + 3y = 7$ by Gauss Seidel method.

(10 × 5 = 50 marks)

Part B

Answer **one** *full section from each question.*

Each question carries 10 *marks.*

16. (a) Illustrate the basic organization of a computer system with block diagram.

Or

(b) Design an algorithm and draw a flowchart to find the sum of n natural numbers.

17. (a) Explain various decision making and branching statements in C language.

Or

(b) Discuss the various operators in C language with example.

18. (a) Write C program to find the transpose of given matrix of size $n \times n$.

Or

(b) Explain the following string handling functions with example :

(i) strcpy ( ). (2 marks)

(ii) strcmp ( ). (2 marks)

(iii) strcat ( ). (2 marks)

(iv) strlen ( ). (2 marks)

(v) strrev ( ). (2 marks)

19. (a) Illustrate call-by-value and call-by-reference parameter passing technique with examples.

Or

(b) Explain the concept of passing arrays to functions with example.

20. (a) Find the means of X and Y variables and the coefficient of correlation between them from the following two regression equations:

$4x - 5y + 33 = 0$

$20x - 9y - 107 = 0$.

Or

(b) Write a C program to implement Gauss Elimination method.

[5 × 10 = 50 marks]

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2021

B.Tech.

EN 19 401—ENGINEERING MATHEMATICS – IV

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. The joint density of X and Y is given by :

$$f(x,y)=\begin{cases} k\,e^{-(2x+3y)} & x>0, y>0 \\ 0 & \text{elsewhere.} \end{cases}$$

Find k.

2. If $f(x,y)=\begin{cases} x^2+\frac{xy}{3}, & 0<x<1,\ 0<y<2 \\ 0 & \text{otherwise} \end{cases}$ is a joint pdf, find $p\left(x>\frac{1}{2}\right)$.

3. Find the marginal density functions of X and Y if $f(x,y)=4(1-x)(1-y)$ is a joint p.d.f. for $0<x<1$ and $0<y<1$.

4. An insurance company has discovered that only about 0.1% of the population is involved in a certain type of accident each year. If its 10,000 policy holders were randomly selected from the population, what is the probability that not more than 5 of its clients are involved in such an accident next year ?

5. If an auditor selects 5 returns from among 15 returns of which 9 contain illegitimate deductions, what is the probability that a majority of the selected returns contains illegitimate deductions.

6. If X is uniformly distributed random variable with mean 1 and variance $\frac{4}{3}$, find $P(x<0)$.

7. A stenographer claims that she can take dictation at the rate of 120 words per minute. Can we reject her claim on the basis of 100 trials in which she demonstrate a mean of 116 words with a S.D. of 15 words ? Use 5% level of significance.

8. The mean produce of wheat of a sample of 100 fields is 200 lbs per acre with a S.D. of 10 lbs. Another sample of 150 fields gives the mean of 220 lbs with a S.D. of 12 lbs. Can the two samples be considered to have been taken from the same population whose S.D. is 11 lbs ? Use 5% level of significance.

9. A sample of size 13 gave an estimated population variance of 3.0, while another sample of size 15 gave an estimate of 2.5. Could both samples be from populations with the same variance.

10. Show that $f(z)=e^z$ is differentiable everywhere. Find its derivative.

11. Show that $e^x(x\cos y - y\sin y)$ is a harmonic function.

12. Find the analytic function whose imaging part is $\frac{x-y}{x^2+y^2}$.

13. Evaluate $\int_C \frac{zdz}{z^2-1}$ where C is $|z|=2$ by Cauchy's integral formula.

14. Expand $f(z)=\frac{\sin z}{z-\pi}$ about $z=\pi$ in Taylor's series.

15. Evaluate $\int_C \frac{e^{2z}}{(z-1)^2(z-2)}dz$, where C is $|z|=3$. Using Cauchy's residue theorem.

(10 × 5 = 50 marks)

Part B

Answer one full section from each question.
Each question carries 10 *marks.*

16. (a) If X and Y have joint p.d.f given by :

$$f(x,y)=\begin{cases}\frac{1}{8}(6-x-y), 0<x<2,\ 2<y<4\\ 0, \quad \text{elsewhere.}\end{cases}$$

(i) Examine whether X and Y are independent.

(ii) Compute $P(x<1,y<3), P(x+y<3), P(x<1/y<3)$.

Or

(b) If X and Y have joint p.d.f. given by :

$$f(x,y) = \frac{2x+3y}{72}, x = 0,1,2 ; y = 1,2,3.$$

(i) Find the conditional distribution of X given $x + y = 3$.

(ii) Examine whether X and Y are independent.

17. (a) In a test on 2,000 electric bulbs, it was found that the life of a particular make was normally distributed with an average of 2040 hrs and S.D. of 60 hours. Estimate the number of bulbs likely to burn for :

(i) more that 2150 hours ;

(ii) less than 1950 hours ; and

(iii) more than 1920 hours but less than 2160 hours.

Or

(b) Fit a binomial distribution to the data :

x	0	1	2	3	4	5	6
f	13	25	52	58	32	16	4

18. (a) The following table gives the number of accidents that took place in an industry during various days of the week. Test if accidents are uniformly distributed over the week :

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	18	12	11	15	14

Or

(b) The two random samples reveal the following data :

Sample no.	Size	Mean	Variance
I	16	440	40
II	25	460	42

Test whether the samples come from the same normal population.

19. (a) (i) If u and v are harmonic functions, prove that $\left(\frac{\partial u}{\partial y}-\frac{\partial v}{\partial x}\right)+i\left(\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}\right)$ is analytic.

(ii) Discuss the transformation $w=\sin z$.

Or

(b) (i) Find the bilinear mapping that maps $z=i,-i,1$ into $w=0,1,\infty$ respectively.

(ii) Find the image of $-1<x<1$ under $w=e^z$.

20. (a) Expand $\frac{1}{(z-2)(z-3)}$ in :

(i) $|z|<2$.

(ii) $2<|z|<3$.

(iii) $|z|>3$.

(iv) $0<|z-2|<1$.

Or

(b) Evaluate $\int_0^{2\pi}\frac{d\theta}{a+b\sin\theta},(a>b>0)$.

(5 × 10 = 50 marks)