

THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION, NOVEMBER 2021

Instrumentation

INS 3B 04—INDUSTRIAL INSTRUMENTATION—I

(2019—2020 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type Questions)*Answer at least eight questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 24.*

1. List any two applications of piezoelectric transducer.
2. Describe the working principle of drag cup tacho meter.
3. What are the errors in magneto strictive transducers ?
4. Explain the working of bourdon tube.
5. List any two pressure sensing elements.
6. Define dew point.
7. What are the units of pressure ?
8. Give classification of hygrometer.
9. How a dead weight tester works ?
10. Draw a differential pressure transmitter.
11. Explain the operating principle of eddy current tacho generator.
12. What is a function of loadcell ?

(8 × 3 = 24 marks)

Section B (Paragraph Type Questions)*Answer at least five questions.**Each question carries 5 marks.**All questions can be attended.**Overall Ceiling 25.*

13. Explain the working of ultrasonic level meter.
14. Explain how differential pressure sensing is employed in a closed tank to measure level.

Turn over

15. Explain aluminum oxide hygrometer with figure.
16. Explain bonded strain gauge with figure.
17. Describe Pirani gauge with figure.
18. Compare hydraulic & pneumatic load cells.
19. Explain the working of dew point hygrometer.

(5 × 5 = 25 marks)

Section C (Essay Type Questions)

Answer any one question.

The question carries 11 marks.

20. Making use of a neat sketch explain the construction and working of capacitance type level gauge for non-conducting liquids ?
21. Explain the pressure measurement using following gauges 1. Mcleod Gauge 2. Thermal conductivity Gauge.

(1 × 11 = 11 marks)

**THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2021**

Instrumentation

INS 3B 03—SIGNALS AND SYSTEMS

(2019—2020 Admissions)

Time : Two Hours and a Half

Maximum : 80 Marks

Section A (Short Answer Type Questions)

Answer at least ten questions.

Each question carries 3 marks.

All questions can be attended.

Overall Ceiling 30.

1. Compare Power and Energy signals.
2. Given $x(t) = 2\cos t/4$. Check whether the signal is periodic
3. Draw the signal $u(t + 10)$.
4. Determine the odd and even part of $x(t) = e^t$.
5. Differentiate between static and dynamic systems.
6. $y(t) = x(-t - 2)$. Is the system stable ?
7. $y(t) = Ax(t) + B$. Check the linearity of the system.
8. Check the casuality of the system : $y'(t) = x(t) + 2x(3 - t)$.
9. Define magnitude and phase spectrum.
10. Determine the exponential Fourier series representation of $x(t) = \cos 4t$.
11. Write two properties Fourier Transform.

12. A continuous time signal varies exponentially in the interval 0 to T. Find the Fourier constant $a_{0/2}$.
13. Define the property time shifting in Laplace Transform.
14. Explain the stability in s domain.
15. What is the Laplace transform of the unit impulse signal ?

(10 × 3 = 30 marks)

Section B (Paragraph Type Questions)

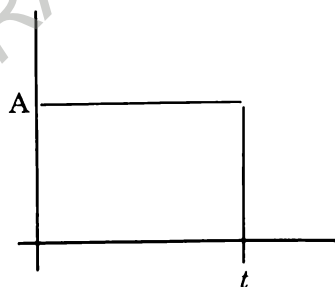
Answer at least five questions.

Each question carries 6 marks.

All questions can be attended.

Overall Ceiling 30.

16. What is a delayed unit step signal ? Explain with example.
17. Determine the energy and power of a unit impulse signal.
18. Given that $y(t) = x(t^2)$. Check whether the system is stability.
19. Define the commutative property of convolution.
20. Find the Fourier Transform of the signal $x(t) = t \sin \Omega_0 t$.
21. Determine the Fourier transform of a rectangular pulse.



22. Define final value theorem.
23. Determine the Laplace transform for a unit Ramp signal at $t = a$.

(5 × 6 = 30 marks)

Section C (Essay Type Questions)

Answer any two questions.

Each question carries 10 marks.

24. Sketch the signal, $x(t) = u(t) + tu(t) - (t-1)u(t-1) - 3u(t-2)$.
25. Perform convolution of the following causal signals. Given $x_1(t) = \cos t u(t)$ and $x_2(t) = tu(t)$.
26. Determine the Fourier constant a_0 for the continuous time signal defined as

$$\begin{aligned} x(t) &= KT && ; 0 < t < T/2 \\ &= K(T-t) && ; T/2 < t < T. \end{aligned}$$

27. Using Laplace transform, determine the natural response of the system described by the equation

$$d^2 y(t)/dt^2 + 6 dy(t)/dt + 5 y(t) = dx(t)/dt + 4 x(t); y(0) = 1; dy(t)/dt |_{t=0} = -2.$$

(2 × 10 = 20 marks)

**THIRD SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2021**

Instrumentation

ITN 3B 03—MEASUREMENT TECHNIQUES

(2014—2017 Admissions)

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all the ten questions.

Each question carries 1 mark.

1. The square of standard deviation is called :
 - (a) Mean.
 - (b) Median.
 - (c) Mode.
 - (d) Variance.
2. The international standard for mass is :
 - (a) Standard kilogram.
 - (b) Standard gram.
 - (c) Standard milligram.
 - (d) None of these.
3. The S. I. unit for thermodynamic temperature is :
 - (a) Absolute zero.
 - (b) Kelvin.
 - (c) Degree Celsius.
 - (d) Degree Fahrenheit.
4. Power factor is measured by :
 - (a) Cosine of phase angle between voltage and current.
 - (b) Sine of phase angle between voltage and current.
 - (c) Cosine and sine of phase angle between voltage and current.
 - (d) None of the above.
5. A series type ohmmeter is used for measuring :
 - (a) Low values of resistances.
 - (b) Wide range of resistance.
 - (c) Only very high values of resistance.
 - (d) None of the above.

Turn over

6. An electro-dynamometer can be used for measuring :
- (a) Only a.c. power. (b) Only d.c. power.
(c) Both a.c. and d.c. power. (d) None of the above.
7. _____ type of strip chart recorder operates on the deflection principle.
- (a) Galvanometer. (b) Null.
(c) Potentiometric. (d) X – Y.
8. Electrostatic stylus is a _____ mechanism.
- (a) Cutting. (b) Marking.
(c) Data logging. (d) None of these.
9. A bridge circuit works at a frequency of 2 kHz. The following can be used as detectors for detection of null condition in the bridge.
- (a) Vibration galvanometers and headphones.
(b) Headphones and tunable amplifiers.
(c) Vibration galvanometers and tunable amplifiers.
(d) Vibration galvanometers, headphones and tunable amplifiers.
10. Wagner's Earth Devices are used in a.c. bridge circuits for :
- (a) Eliminating the effect of earth capacitances.
(b) Eliminating the effect of inter-component capacitances.
(c) Eliminating the effect of stray electrostatic fields.
(d) Shielding the bridge elements.

(10 × 1 = 10 marks)

Section B

*Answer any ten questions.
Each question carries 2 mark.*

11. What is random error ? How is it caused ?
12. Name the important systems of units.
13. What are the purposes of measurement ?
14. State and explain the mechanism which develops galvanometer damping.
15. Explain with circuit diagram a rectifier type a.c. measuring device.

16. Draw the circuit diagram of a power factor meter.
17. In marking mechanism, what is optical marking ?
18. What is meant by a null type recorder ?
19. What is a data logger ?
20. Obtain the expression for frequency of Wien's bridge.
21. Draw the Thevenin's equivalent circuit of a Wheatstone's bridge.
22. Draw the circuit of a Maxwell's bridge.

(10 × 2 = 20 marks)

Section C

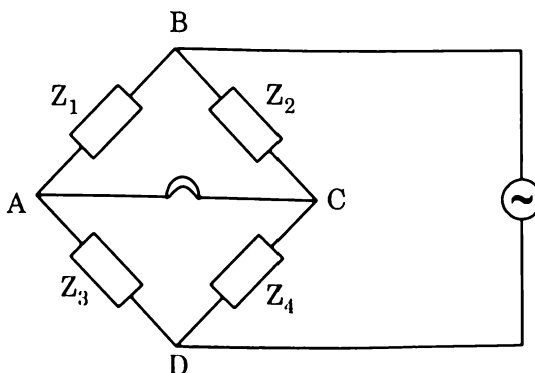
Answer any **six** questions.

23. The value of a resistor is specified as $500 \Omega \pm 10 \%$ by a manufacturer. Find the limits of resistance between which the value is guaranteed.
24. A 0 – 150 V voltmeter has a guaranteed accuracy of 1 percent of full scale reading. The voltage measured by this instrument is 83 V. Calculate the limiting error in percent.
25. If we adopt new units of voltage and current such that one new unit voltage = 100 volt and one new unit of current = 100 ampere, how would the unit of inductance be affected ?
26. Explain with schematic representation the working of a basic thermo instrument.
27. Describe with necessary figure the working of a suspension P. M. M. C. galvanometer.
28. With the help of a block diagram explain the working of an X – Y recorder.
29. Explain the different tracing systems used in a strip chart recorder.
30. Calculate the value of Z_4 in polar form of the following basic a.c. bridge.

$$Z_1 = 100 \Omega \angle 80^\circ \text{ (inductive impedance).}$$

$$Z_2 = 250 \Omega \text{ (pure resistive).}$$

$$Z_3 = 400 \Omega \angle 30^\circ \text{ (inductive impedance).}$$



Turn over

31. Draw the Schering bridge and obtain the expression for unknown resistance and capacitance.
(6 × 5 = 30 marks)

Section D

*Answer any **two** questions.*

Each question carries 10 marks.

32. Enumerate the various types of error encountered in a measurement system.
33. Describe the construction and working of a shunt type ohmmeter. Write down its design equations. Why are series type ohmmeters preferred over shunt type ohmmeters ?
34. Describe with block diagram the working of a potentiometer type strip chart recorder. Also discuss the features of a circular chart.
35. Draw an a.c. bridge and discuss the conditions for balance. Draw the Hay's bridge and obtain the expressions for unknown resistance and inductance.

(2 × 10 = 20 marks)