

**THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION, NOVEMBER 2020**

## Instrumentation

## INS 3B 04—INDUSTRIAL INSTRUMENTATION—I

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. Describe the working of piezoelectric transducer.
2. Explain the working principle of eddy current tacho meter.
3. What are the different types of magnetostrictive transducers ?
4. Explain the working of bourdon tube.
5. List any two pressure sensing elements.
6. Classify strain gauges.
7. Sketch a bellow and explain working.
8. How relative humidity is measured by hair hygrometer ?
9. Explain level measurement by Gamma ray method.
10. How humidity is measured by a microwave refractometer ?
11. Define pH.
12. What are the different types of humidity sensors ?

(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 capacitive level meter.
14. Explain how differential pressure sensing is employed in a closed tank to measure level.

**Turn over**

15. List the classification of level sensors.
16. Explain bonded strain gauge with figure.
17. Describe ionization gauge with figure.
18. Compare hydraulic and pneumatic load cells.
19. Explain the working of resistive hygrometer.

(5 × 5 = 25 marks)

**Section C (Essay Type Question)**

*Answer any **one** question.*

*The question carries 11 marks.*

20. Making use of a neat sketch explain the construction and working of dry and wet bulb psychrometer.
21. Explain the pressure measurement using following gauges :
  - (a) Knudsen gauge.
  - (b) Deadweight gauges.

(1 × 11 = 11 marks)

**THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION  
NOVEMBER 2020**

Instrumentation

INS 3B 03—SIGNALS AND SYSTEMS

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 Deterministic and Random signals ?
2. Is sinusoidal signal periodic. Explain ?
3. Prove  $x(t) = e^{-2t} u(t)$  is a energy signal.
4. Let  $x(t) = at + b e^{-2t}$ . What will be the folded version of  $x(t)$ .
5. Explain the tenn system with respect to the signals ?
6.  $y(t) = ax(t)$ . Is the system static or dynamic ?
7.  $y(t) = tx(t)$ . Check the linearity of the system.
8. What is the condition for stability in LTI system ?
9. Explain the conditions for the existence of Fourier Series
10. Write in deail about the linearity property of Fourier Series Co-efficients.
11. Define inverse Fourier Transform.
12. A periodic signal  $x(t)$  is defined as  $x(t) = (1 - t)^2$ ;  $0 < t < T$ . Find the Fourier coefficient  $bn$ .
13. Define the Laplace Transform ?
14. What is Region Of Convergence ?
15. Find the Laplace Transfonn of  $t u(t)$

(10 × 3 = 30 marks)

Turn over

### Section B (Paragraph Type Questions)

Answer at least **five** questions.

Each question carries 6 marks.

All questions can be attended.

Overall Ceiling 30.

16. Determine the even and odd part of the continuous time signal  $x(t) = e^t$
17. What are the two types of scaling in continuous time signals.
18. Given that  $y(t) = x(t) + 2x(3-t)$ . Check whether the system is causal or non causal.
19. What is the impulse response of a LT1 system ?
20. Find the Fourier transform of the signal  $e^{-3(t)} u(t)$ .
21. Explain the frequency spectrum using Fourier Transform.
22. Define any *two* properties of Laplace Transform.
23. Determine the Laplace transform for a unit Ramp signal at  $t = a$ .

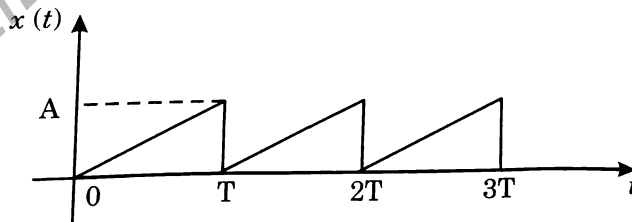
(5 × 6 = 30 marks)

### Section C (Essay Type Questions)

Answer any **two** question.

Each question carries 10 marks.

24. Explain in detail the classifications of discrete time signals
25. Perform convolution of the following signals. Given  $x_1(t) = \cos t u(t)$  and  $x_2(t) = t u(t)$ .
26. Determine the exponential form of the Fourier Series representation of the signal shown in the figure :



If  $X(s) = 2/(s + 3)$ . Find the Laplace transform of  $d/dt x(t)$ .

(2 × 10 = 20 marks)

**THIRD SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION  
NOVEMBER 2020**

Instrumentation

ITN 3B 03—MEASUREMENT TECHNIQUES

(2018 Admission)

Time : Three Hours

Maximum : 80 Marks

**Section A (Objective Type Questions)**

*Answer all questions.  
Each question carries 1 mark.*

1. Wheatstone bridge is used for measurement of :
  - (a) Resistance.
  - (b) Capacitance.
  - (c) Inductance.
  - (d) None of the above.
2. A Wheatstone bridge cannot be used for precise measurement of resistance due to the errors introduced by :
  - (a) Resistance of connecting leads.
  - (b) Contact resistances.
  - (c) Thermos-electric EMFs.
  - (d) All of the above.
3. Maxwell's bridge is used for measurement of inductance. (True/False)
4. X-Y Recorders record one dependent variable with respect to an independent variable. (True/False)
5. A disadvantage of Galvanometer type strip chart recorder is its slow response time. (True/False)
6. The scale of a series-type Ohmmeter indicates \_\_\_\_\_ at the extreme left and zero at the extreme right.
7. In permanent magnet moving coil instruments, the deflection of pointer is directly proportional to \_\_\_\_\_ flowing through it.
8. Watt-hour meters are used for measurement of \_\_\_\_\_.
9. Strip-chart recorder is an example of data presentation element in a measurement system. (True/False)
10. Pressure measurement unit PSI stands for \_\_\_\_\_.

(10 × 1 = 10 marks)

**Turn over**

**Section B (Short Answer Type Questions)**

*One or two sentences each.*

*Answer any ten questions.*

*Each question carries 2 marks.*

11. What are the three major categories of systematic errors ?
12. In a measurement process, what are random errors ?
13. What are the advantages of PMMC instruments ?
14. What are the major features of a suspension type Galvanometer ?
15. What are the differences between Maxwell and Hays Bridge ?
16. What are the limitations of Wheatstone bridge ?
17. List the *two* types of strip-chart recorders.
18. A 0-20 A ammeter has an accuracy of 2% of full-scale deflection. What is the limiting error in percentage while reading a current of 2.5 A ?
19. When is a Hay's Bridge preferred over Maxwell's bridge ?
20. What are the advantages of Schering's bridge ?
21. How does the braking system in a watt-hour meter work ?
22. What is the purpose of primary sensing element in a measurement system ?

(10 × 2 = 20 marks)

**Section C (Paragraph Type Questions)**

*Answer any six questions.*

*Each question carries 5 marks.*

23. A watt meter having a range of 100W has an error of  $\pm 1\%$  of full scale deflection. If the true power is 10W, what would be the range of readings ?
24. A 0-150 V voltmeter has an accuracy of 1% of full scale reading. The voltage measured by this voltmeter is 75 V. Calculate the limiting error in percentage.
25. What are the advantages and disadvantages of an electrodynamic type power factor meter ?
26. What the major sources of errors in power measurement using electrodynamic type wattmeter ?
27. Explain the working of a galvanometer type strip-chart recorder.

28. Explain the balance condition of a Wheatstone bridge with the help of relevant circuit diagram.
29. What are the applications of X-Y recorders ?
30. What is the need for Wagner ground connection? How does it work ?
31. With the help of a circuit diagram, derive the expression for balanced condition of Schering's bridge.

(6 × 5 = 30 marks)

### Section D (Essay Type Questions)

*Answer any two questions.*

*Each question carries 10 marks.*

32. Explain the major functional elements in a generalized measurement system. '
33. Discuss with the help of relevant diagrams, the working of a single-phase electro-dynamometer type single phase power factor meter.
34. Describe with the help of a block diagram, the working of a strip-chart recorder.
35. Explain the balance condition of a Kelvins double bridge with the help of relevant circuit diagram.

(2 × 10 = 20 marks)

**THIRD SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION  
NOVEMBER 2020**

Instrumentation

ITN 3B 03—MEASUREMENT TECHNIQUES

(2014 Admissions)

Time : Three Hours

Maximum : 80 Marks

**Part A**

*One mark questions.*

*Each question carries 1 mark.*

1. What is a Transducer ?
2. What is an instrumental error ?
3. Give an example for integrating instrument ?
4. What is an analog instrument ?
5. Define controlling force.
6. Define loading effect.
7. What is meant by measurement ?
8. Define Calibration.
9. What is range and span ?
10. How is 1 metre defined ?

(10 × 1 = 10 marks)

**Part B (Short Answer Questions)**

*Answer any ten questions.*

*Each question carries 2 marks.*

11. What is meant by international standard ?
12. Define any *two* static characteristics ?
13. What is the principle of PMMC ?
14. Is thermocouple instruments a form of electrothermic instruments ? Why ?
15. List any *two* advantages of null type instruments ?
16. Describe the torque equations for a moving coil instruments ?

**Turn over**



17. List any *two* advantages of magnetic tape recorders ?
18. What is meant by suspension ? What is the use of suspension in moving system ?
19. What is the difference between standard and unit ?
20. Define Power. What are the methods for power measurement ?
21. What are the applications of bridge circuits ?
22. What are the advantages of data loggers ?

(10 × 2 = 20 marks)

### Part C (Long Answer Questions)

*Answer any six questions.*

*Each question carries 5 marks.*

23. A voltage has a true value of 1.50 V. An analog indicating instrument with a scale range of 0-2.50V shows a voltage of 1.46 V. What are the values of absolute error and correction. Express the error as a fraction of the true value and the full scale deflection ?
24. List the disadvantages of potentiometric recorders ?
25. Describe the working of a data logger ?
26. Why do we need to calibrate instruments ?
27. Explain about the generalized input-output configuration of measurement systems ?
28. How are analog instruments classified based on the principle of operation ?
29. Explain the theory of ballistic galvanometers ?
30. What are the main sources of errors in moving coil instruments ?
31. What are the advantages and disadvantages of strip chart recorders ?

(6 × 5 = 30 marks)

### Part D (Essay Questions)

*Answer any two questions.*

*Each question carries 10 marks.*

32. Describe the working of strip chart recorders ?
33. Explain the measurement using wheatstones bridge ?
34. Explain the principle and measurement technique in Electrodynamometer type instrument ?
35. Describe the functional elements of a generalized measurement system ?

(2 × 10 = 20 marks)