Total No. of printed pages = 8

CAI-503/PoI/5th Sem/2017/N

PRINCIPLES OF INSTRUMENTATION

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

SECTION – A

Answer any *twenty five* questions : 1×25=25

1. Full form of LED is _____, CRT is _____.
2. Unit of pressure in FPS system is _____.
3. Atmospheric pressure (atm) = _____ mmHg.
4. Full form of OP-AMP is _____. Full form of RTD is _____.
5. Gain 1000 = _____ dB.
6. 1°K = _____ °C.

[Turn over

7. X_L = _____, X_C = _____.

8. A+j*B = _____ ∠ _____.

9. Wheatstone bridge are two types : _____ and _____.

10. Environmental effects are modifying input and _____.

11. Which of the following have pass band of low frequency range ?

(a) High pass filter (b) Band pass filter

(c) Low pass filter (d) Band stop filter

12. Which of the following causes noise in passive filters ?

(a) Capacitor (b) Resistor

(c) Inductor (d) None of the mentioned

13. Self generating type transducers are _____ transducers.

(a) Active (b) Passive

(c) Secondary (d) Inverse

14. The transducer that converts the input signal into the output signal, which is a discrete function of time, is known as _____ transducer.

(a) Active (b) Analog

(c) Digital (d) Pulse

15. Which of the following is a digital transducer ?

(a) Strain gauge (b) Encoder

(c) Thermistor (d) LVDT

16. Strain gauge, LVDT and thermocouple are examples of

(a) Active transducers

(b) Passive transducers

(c) Analog transducers

(d) Primary transducers

17. An inverse transducer is a device which converts

(a) An electrical quantity into a non-electrical quantity

(b) Electrical energy into light energy

(c) Electrical energy into thermal energy

(d) Electrical quantity into mechanical quantity

18. A strain gauge is a passive transducer and is employed for converting

(a) Mechanical displacement into a change of resistance

(b) Force into a displacement

(c) Pressure into a change of resistance

(d) Pressure into displacement

19. Resolution of a transducer depends on

(a) Material of wire

(b) Length of wire

(c) Diameter of wire

(d) Excitation voltage

20. In wire wound strain gauges, the change in resistance is due to _____.

21. Certain type of materials generates an electrostatic charge or voltage when mechanical force is applied across them. Such materials are called

(a) Piezo-electric

(b) Photo-electric

(c) Thermo-electric

(d) Photo-resistive

22. Piezo-electric transducers are

(a) Passive transducers

(b) Inverse transducers

(c) Digital transducers

(d) Pulse transducers

23. The drawbacks of strain gauges are _____ and _____.

24. LVDT windings are wound on

(a) Steel sheets (b) Aluminium

(c) Ferrite (d) Copper

25. The size of air cored transducers in comparison to the iron core parts is

(a) Smaller (b) Larger

(c) Same (d) Unpredictable

26. The principle of operation of LVDT is based on the variation of

(a) Self inductance

(b) Mutual inductance

(c) Reluctance

(d) Permanence

27. Capacitive transducers are normally employed for _____ measurements.

(a) Static

(b) Dynamic

(c) Transient

(d) Both static and dynamic

28. The transducers which require an external power are called as _____.

(a) Active transducer

(b) Primary sensor

(c) Passive transducer

(d) Self generating transducer

29. The principle of operation of variable resistance transducer is

(a) Deformation leads to change in resistance

(b) Displacement of a contact slider on a resistance

(c) Coupling of two coils changes with displacement

(d) Movement of magnetic field produces variation in resistance of material

30. The change in resistance of a metal wire owing to strain is due to _____.

SECTION – B

Answer any *three* questions : 15×3=45

1. (a) Derive the second order RLC series electrical circuit transfer function. 6

(b) Define the following terms : 4

(i) Resolution (ii) Hysteresis

(iii) Linearity

(c) What are the classifications of errors ? 5

2. (a) If $R_1 = \frac{R_2 R_3}{R_4}$, $R_2 = 100\Omega \pm 2\%$

$R_3 = 200\Omega \pm 4\%$, $R_3 = 300\Omega \pm 8\%$

Calculate the limiting resistance of R_1. 6

(b) Explain temperature measurement using RTD. 5

(c) Write six measurement techniques using resistive sensors. 4

3. (a) Write the basic cathode ray tube construction with functional description. 9

(b) A 100μA ammeter has an internal resistance of 50Ω. For extending its range to measure 200μA, find the shunt resistance required. 6

4. (a) What is LED ? How it works ? 5

(b) Discuss the characteristics of an ideal operational amplifier. 5

(c) What is the input impedance of an inverting operational amplifier ? 5

5. (a) Draw the Instrumentation amplifier circuit with output equation and advantages. 5

(b) "A buffer can be used to reduce loading effect". Justify the statement. 5

(c) What are the specifications of our domestic power supply ? Why ? 5