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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2024

Fourth Semester

Core Course—INSTRUMENTATION ELECTRONICS

(Common for B.Sc. Electronics and B.Sc. Computer Maintenance and Electronics)

[2013—2016 Admissions]

Time : Three Hours Maximum Marks : 80

Part A

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

Choose the most appropriate answer :

1. In a generalised measurement system, the function of the signal manipulating element is to :

   (a) Change the quantity under measurement to an analogous signal.

   (b) Change the magnitude of the input signal while retaining its identity.

   (c) To perform linear operations like addition and multiplication.

   (d) To perform non-linear operations life filtering chopping, clamping etc.

2. In measurement systems, which of the following static characteristics is desirable ?

   (a) Accuracy. (b) Sensitivity.

   (c) Reproducibility. (d) All the above.

3. The units whose sizes cannot be choosen independently are called :

   (a) Derived units.

   (b) Fundamentals units.

   (c) Absolute units.

   (d) Auxiliary fundamentals units.

Turn over

4. Why are multimeters provided with separate scale for low ac voltages ?

   (a) To have high accuracy.

   (b) To improve the readability of the scale.

   (c) To take into account the high value of resistance of rectifier at low voltages and currents and also the fact that at low voltages the value of rectifier resistance is not constant but varies considerably even for small changes in voltages.

5. The source of emission of electrons in a CRT is :

   (a) PN junction diode.

   (b) A barium and stronthium oxide coated cathode.

   (c) Accelerating anode.

   (d) Pre-accelerating anode.

6. In wire wound strain gauges, the change in resistance on application of strain is mainly due to :

   (a) Change in length of the wire.

   (b) Change in diameter of the wire.

   (c) Change in both length and diameter of the wire.

   (d) Temperature of the wire.

7. In an LVDT, the two secondary windings are connected in differential to obtain :

   (a) Higher output voltage.

   (b) An output voltage which is phase sensitive as the output voltage has a phase which can lead us to a conclusion whether the displacement of the core took place form right to left or from left to right.

   (c) In order to establish the null or the reference point for the displacement of the core.

   (d) Both (b) and (c).

8. A thermocouple :

   (a) Has a low time constant when it is bare.

   (b) Has a low time constant if it is provided with a sheath.

   (c) Has the same time constant whether it is bare or is provided with sheath.

   (d) None of the above.

9. A Wheatstone bridge cannot be used for precision measurements because errors are introduced into it on account of :

   (a) Resistance of connecting leads.

   (b) Thermo-electric emfs.

   (c) Contact resistances.

   (d) All of the above.

10. A triangular waveship is obtained :

   (a) By integrating a square wave.

   (b) By integrating a sine wave.

   (c) By differentiating a square wave.

   (d) By differentiating a sine wave.

(10 × 1 = 10)

Part B

Answer any **eight** *questions.*
Each question carries 2 *marks.*

11. Distinguish between static and dynamic characteristics of a measurement system.

12. What are limiting errors ? Explain.

13. What do you mean by "Delay Line" in a CRO ? How its works ?

14. Give a comparison of analog and digital multimeters.

15. State the applications of a Wienbridge.

16. List the important specifications of a function generator.

17. Explain what do you mean by harmonic distortion.

18. What is the principle on which a capacitive transducer works ?

19. How does a square pulse differ from a square wave ?

20. What are the precautions to be taken while using a bridge for measurements ?

Turn over

21. Why Maxwell's inductance – capacitance bridge is useful for measurement of inductance of coils having storage factor between 1 and 10 ?

22. Explain how spectrum of a continuous wave signal is displayed ?

(8 × 2 = 16)

Part C

Answer any **six** *questions.*
Each question carries 4 *marks.*

23. Explain the differences between accuracy and precision with the help of suitable examples.

24. A wattmeter having a range of 500 W has an error of $\pm$ 1.5 % of full scale deflection. If the true power is 50 W. What would be the range of the readings ? If the error is specified as percentage of true value, what would be the range of the readings ?

25. A strain of gauge with a gauge factor of 4 has a resistance of 500 Ω. It is to be used in a test in which the stain to the measured may be as low as 5×10^{-6}. What will be the change in resistance of the strain gauge ?

26. Explain the different principles of working of capacitive transducers.

27. Withe neat diagrams explain the working principles and applications of X-Y recorder.

28. With a neat block diagram, explain the working of a harmonic distortion analyser.

29. Describe the working of a sweep frequency generator. What are the sweep errors ?

30. Describe the working of a low voltage Schering bridge and explain how capacitance and dissipation factor are measured ?

31. With necessary diagrams, explain the principles of working of a dual slope ADC.

(6 × 4 = 24)

Part D

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

32. With neat diagrams, explain the construction and working of LVDT. Draw the set up to show how it can be used to measure the thickness of a metal sheet being rolled ?

33. With necessary block diagram, explain how data convertion is achieved using a Successive Approximation ADC ? Discuss its merits and limitations.

34. With a cross-sectional diagram, explain the working of each electrode in a CRT. Describe the functional working of a storage oscilloscope clearly explaining the role of each block in it.

35. Describe the working of Hay's bridge for measurement of inductance. Derive the equations for balance and draw and explain the phasor diagram under conditions of balance. Why is this bridge suited for measurement of inductance of high Q coils ?

(2 × 15 = 30)