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10641

Reg. No. :

Name :

**Fourth Semester B.Tech. Degree Examination, February 2016
(2013 Scheme)**

13.404 : Electrical Measurements and Measuring Instruments (E)

Time : 3 Hours

Max. Marks : 100

PART – A

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

1. Write the classification of analog instruments.
2. What are the essential requirements of voltmeter multipliers ?
3. What is the significance of IS standards of instruments ?
4. State the advantages and disadvantages of flux meters.
5. Define 'Nominal Ratio' and 'Ratio Correction Factor' in instrument transformers.
6. Write the differences between CT and PT.
7. Name the sources and detectors commonly used for AC bridges.
8. If the bandwidth of an oscilloscope is given as direct current to 10 MHz, what is the fastest rise time a sine wave can have to be accurately reproduced by the instrument ?
9. What are the limitations in series resistance design of high voltage measurements ?
10. What are the various techniques for measurement of high frequency AC impulse voltages.

P.T.O.



PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – 1

11. a) Describe in detail the various types of errors associated in measurement and how these errors are minimized? 10
- b) The inductance of a moving iron ammeter with a full scale deflection of 90 at 1.5 A, is given by the expression $L = (200 + 40\theta - 4\theta^2 - \theta^3) \mu\text{H}$, where θ is the deflection in radian from zero position. Estimate the angular deflection of the pointer for a current of 1 A. 10

OR

12. a) Derive the torque equation of Electro-dynamometer type wattmeter. Comment upon the shape of scale if spring control is used. 10
- b) Explain in detail the working of a Trivector meter. 10

Module – 2

13. a) Explain wattmeter method of measurement of iron loss in ferro-magnetic materials. 10
- b) The coil of a moving coil galvanometer is wound on a non-magnetic former whose length and width are both 20 mm. It moves in a constant field of 0.12 Wb/m^2 . The moment of inertia of its moving part is $0.25 \times 10^{-6} \text{ kg-m}^2$, and the control spring constant is $30 \times 10^{-6} \text{ Nm/rad}$. Calculate :
- i) The number of turns that must be wound on the coil to produce a deflection of 150 with a current of 10 mA.
- ii) The resistance of the coil to produce critical damping, all damping being assumed as Electromagnetic. 10

OR

14. a) Explain the Absolute Null method of testing of a potential transformer. 10
- b) A current transformer has a single turn primary and a 200 turns secondary winding. The secondary winding supplies a current of 5 A to a non-inductive burden of 1Ω resistance. The requisite flux is set up in the core by an mmf of 80 A. The frequency is 50 Hz. Calculate the ratio and phase angle of the transformer. Also find the maximum flux in the core. 10



Module – 3

15. a) Derive the condition of balance and the expression for bridge sensitivity for a Wheatstone bridge with equal arms. **12**
- b) Explain the working of Maxwell's inductance-capacitance bridge for measurement of inductance. Draw the phasor diagram for balance conditions. **8**

OR

16. a) Explain the calibration of Ammeter and Voltmeter. **10**
- b) Describe how the following measurements can be made with the use of a CRO.
- i) Phase angle
 - ii) Frequency. **10**

Module – 4

17. a) Discuss and compare the performance of
- i) Resistance
 - ii) Capacitance potential dividers for measurement of impulse voltages. **12**
- b) An absolute electrostatic voltmeter has a movable circular plate 8cm in diameter. If the distance between the plates during a measurement is 4 mm, determine the potential difference when the force of attraction is 0.2 gm wt. **8**

OR

18. a) What is the importance of the value of Earth's resistance ? What are the factors which influence its value ? Describe the working of an Earth Tester. **10**
- b) Describe the working principle, applications and the advantages of Phasor Measurement Units. **10**
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