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Question Paper Code : 31418

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Third Semester

Electronics and Instrumentation Engineering

EI 2202/EI 34/EI 1201 /10133 EI 306/080300004 — ELECTRICAL MEASUREMENTS

(Common to Instrumentation and Control Engineering)

(Regulation 2008 /2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the essential features of indicating instruments?

2. Give any two advantages and disadvantages of thermal type instruments.

3. Mention the adjustments required for an energy meter to read accurately with minimum possible errors.

4. What are the technical parameters to be considered while grounding?

5. How does a P.T. differ from a power transformer?

6. State the reason why current transformer must never be operated on open circuit.

7. How are resistances classified?

8. What precautions should be taken while using a bridge?

9. State the applications of Wein's bridge.

10. What are the applications of Vibration galvanometer?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Describe the construction and working of a Ballistic galvanometer. (10)

(ii) What are the main sources of error in moving coil instrument? Explain them briefly. (6)

Or

(b) (i) Explain the construction and operation of electrodynamometer type moving coil ammeter. (10)

(ii) A moving coil instrument gives a full scale deflection of 1 mA when the potential difference across its terminals is 10 mV. Calculate the shunt resistance for a full scale reading with 100 V. (6)

12. (a) (i) What is special feature of a wattmeter suitable for working on L.P.F. circuits? Explain. (8)

(ii) Discuss the errors introduced in the dynamometer type wattmeter due to the resistance of current and potential coils? How are they compensated? (8)

Or

(b) (i) Explain the construction and operation of single phase induction type energy meter. (8)

(ii) What is Phantom loading? Explain with an example how it is more advantages than testing with direct loading. (8)

13. (a) (i) With suitable diagram explain the construction and working of Drysdale type potentiometer. Explain how an unknown voltage can be measured. (10)

(ii) A basic slide wire potentiometer has a working battery voltage of 3.0 V with negligible internal resistance. The resistance of slide wire is 400 Ω and its length is 200 cm. A 200 cm scale is placed along the slide wire. The slide wire has 1 mm scale divisions and it is possible to read upto 1/5 of a division. The instrument is standardized with 1.018 V standard cell with sliding contact at the 101.8 cm mark on scale. Calculate (1) working current, (2) the resistance of series rheostat and (3) the measurement range. (6)

Or

(b) A current transformer with a bar primary has 300 turns in the secondary winding. The resistance and reactance of the secondary circuit are 1.5 Ω,1.0 Ω respectively including the transformer winding. With 5 A flowing in the secondary winding, the magnetizing mmf is 100 A and the iron loss is 1.2 W. Determine the ratio and phase angle errors. (16)

14. (a) (i) Explain the procedure for measuring a low resistance with the help of Kelvin's double bridge. Derive the relation for finding unknown resistance. (10)

(ii) What are the limitations of Wheatstone bridge? (6)

Or

(b) (i) Describe the fall of potential method for measurement of earth resistance. (8)

(ii) The insulation resistance of 2 meter cable was measured by the loss of charge method. The voltage across the standard capacitor of 0.003 μf falls from 222 volt to 155 volt in one minute. Calculate the insulation resistance of the cable. What will be the insulation resistance if the length of the cable is doubled? (8)

15. (a) (i) Explain how self inductance can be measured in terms of a standard capacitor using an AC bridge. (8)

(ii) Explain with neat circuit diagram the working of 'Cambell Bridge'. (8)

Or

(b) (i) A sheet of bakelite 4.5 mm thick is tested at 50 Hz between electrodes 0.12 m in diameter. The Schering bridge employs a standard air capacitor C_2 of 106 pF capacitance, a non-reactive resistance R_1 of $1000/\pi\,\Omega$ in parallel with a variable capacitor C_4, and a non-reactive variable resistance R_3. Balance is obtained with $C_4 = 0.5\ \mu F$ and $R_3 = 260\ \Omega$. Calculate the capacitance, power factor and relative permittivity of sheet. (8)

(ii) Discuss the common sources of error in A.C bridges. How are they eliminated? (8)