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Question Paper Code: 43505

B.E. / B.Tech. DEGREE EXAMINATION APRIL 2019

Third Semester

Electronics and Instrumentation Engineering

14UEI305 – ELECTRICAL MEASUREMENTS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 1 = 10 Marks)

1. A Ballistic galvanometer should be designed with
 - (a) a large period of natural oscillations and a negligible damping constant
 - (b) a small period of natural oscillations and a high damping constant
 - (c) a large period of natural oscillations and a high damping factor
 - (d) a small period of natural oscillations and a low damping factor
2. The power consumption PMMC instruments is typically about
 - (a) 0.25 W to 2W
 - (b) 0.25 mW to 2 mW
 - (c) 25 μ W to 200 μ W
 - (d) none of the above
3. In an Electrodynamometer type of watt meter
 - (a) current coil is fixed
 - (b) pressure coil is fixed
 - (c) any one of the coils can be a fixed one
 - (d) both the coils are movable
4. In an induction type of meter, maximum torque is produced when the phase angle between two fluxes is
 - (a) 0⁰
 - (b) 45⁰
 - (c) 60⁰
 - (d) 90⁰
5. A current transformer has a rating of 100/5A. Its magnetizing and loss components of the exciting current are 1A and 0.6A respectively and secondary winding burden is purely resistive, its transformation ratio at rated current is:
 - (a) 20.12
 - (b) 20.2
 - (c) 200.2
 - (d) none of the above

6. A current transformer has a rating of 100/5 A. Its magnetizing and loss component are 1 A and 0.6 A respectively and secondary winding burden is purely resistive, its transformation ratio at rated current is
- (a) 20.12 (b) 20.2 (c) 200.2 (d) 203
7. A Wheatstone bridge cannot be used for precision measurements because errors are introduced into an account of
- (a) Resistance of connecting leads (b) Thermo-electric emfs
(c) Contact resistances (d) All the above
8. The value of resistances of an earthing electrode depends upon
- (a) shape and material of electrode
(b) depth to which electrode is driven into earth
(c) specific resistances of soil
(d) value of electrode
9. The equations under balance conditions for a bridge are: $R_1 = R_2R_3/R_4$ and $L_1 = R_2R_3C_4$ where R_1 and L_1 are respectively unknown resistances and inductances
- (a) R_2 and R_3 should be chosen as variable
(b) R_2 and C_4 should be chosen as variable
(c) R_4 and C_4 should be chosen as variable
(d) R_3 and C_4 should be chosen as variable
10. A Vibration galvanometer is tuned
- (a) by changing the length and tension of vibrating coil
(b) by attaching weight to the vibrating coil
(c) by changing its damping constant
(d) all the above

PART - B (5 x 2 = 10 Marks)

11. Give the expression for deflection in Moving iron ammeter.
12. Define Phantom loading .
13. Why secondary of current transformer should not be open?
14. What are the depending factors for any earthing system?
15. List the applications of vibration galvanometer.

16. (a) (i) Describe the principle of operation of a PMMC instrument and its constructional details with suitable diagrams. (8)
- (ii) Explain the construction and operation of rectifier type of instruments. (8)

Or

- (b) Describe the constructional details and principle of operation of a D'Arsonval galvanometer. Derive the expression for steady state deflection. (16)
17. (a) Explain in detail about electro-dynamometer watt meters. (16)

Or

- (b) Point out why the phase of shunt is made exactly in 90° out of phase with applied voltage to produce deflecting torque exactly proportional to power. (16)
18. (a) (i) Explain the term "standardization" of a potentiometer. Describe the procedure of standardization of a DC potentiometer. (4)
- (ii) Explain the applications of DC potentiometers in detail. (12)

Or

- (b) (i) Draw the Equivalent circuit and phasor diagram of current transformer and also derive the expression for ratio and phase angle errors. (8)
- (ii) A current transformer with a primary has a 300 turns in its secondary winding. A resistance and reactance of secondary circuit are 1.5Ω and 1.0Ω respectively. The magnetizing mmf is 100A and Iron loss is 1.2 W with secondary winding current is 5A. Find ratio and phase angle errors. (8)
19. (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. (12)
- (ii) What are the limitations of Wheatstone bridge? (4)

Or

- (b) What is the importance of the value of earth resistance? What are the factors influencing it? Discuss the methods used for measurement of earth resistance. (16)

20. (a) (i) Derive the equations for balance in a Maxwell bridge. Draw the phasor diagram for balance conditions. (8)
- (ii) Explain how Wein's bridge can be used for experimental determination of frequency. Derive the expression for frequency in terms of bridge parameters. (8)

Or

- (b) (i) What are the sources of errors in AC bridges? Explain the precautions taken for Elimination. (8)
- (ii) The bridge is balanced at 1000 Hz . It has following components Arm $AB = 0.2\mu F$ Pure capacitance and arm $BC = 500\Omega$ resistance arm $DA = 300\Omega$ resistance parallel with $0.1\mu F$ Capacitance. Find the constants of arm CD , Considering as a series circuit. (8)