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Question Paper Code: 41535

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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 galvanometer uses a circular scale arrangement. The light source is placed 1m away from the moving system in galvanometer. Arrangement is calibrated in mm find deflection?
(a) 1000 mm (b) 2000mm (c) 500 mm (d) 100 mm
2. The power consumption PMMC instruments is typically about
(a) 0.25 W to 2W (b) 0.25mW to 2 mW
(c) 25μW to 200μW (d) none of these
3. The instantaneous torque of an Electrodynamicometer is
(a) $I_1 I_2$ (b) $I_1 I_2 dM/d\theta$ (c) $I_1 I_2 \cos \Phi$ (d) $dM/d\theta$
4. Creeping in a Single phase induction type energy meter may be due to
(a) overcompensation for friction (b) overvoltage
(c) vibrations (d) all the above
5. The standardization of A.C Potentiometer is done by
(a) directly using A.C standard voltage source
(b) using D.C standard sources and transfer instruments

- (c) using D.C standard sources and D'Arsonval galvanometer
 (d) directly using A.C standard voltage source and transfer instruments
6. The standardization of A.C potentiometer is done by
- (a) directly using a.c standard voltage sources
 (b) using d.c standard sources and transfer instruments
 (c) using d.c standard and D'Arsonval galvanometer
 (d) using a.c standard sources and transfer instruments
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 resistance of an earthing electrode depends upon
- (a) shape and material of electrode
 (b) depth to which electrode is driven into earth
 (c) Specific resistance of soil
 (d) all the above
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. Draw two different circuits for measuring power and state the difference between the circuits.

13. Why secondary of current transformer should not be open?
14. Design a Wheatstone bridge whose values are $P = 1000 \Omega$, $Q = 100\Omega$, $R = 2005\Omega$ and $S = 200\Omega$. The battery emf is $5V$ with negligible resistance with negligible galvanometer resistance. Calculate the current flowing through the galvanometer.
15. List the applications of vibration galvanometer.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Explain the principle of working of thermocouple type instruments. Draw the diagram to illustrate the working of contact and non contact type thermo elements. (8)
- (ii) Describe the constructional details of Electro-dynamometer type instrument with its phasor diagram and torque equation. (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) With neat diagram, explain the working of an electro-dynamometer type Wattmeter. Derive an expression for deflection torque and mention its significance. (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) Discuss the construction and working of drysdale polar type potentiometer. (8)
- (ii) What are the functions of transfer instrument and phase shifting transformer? (8)

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) (i) Explain the loss of charge method for measurement of insulation resistances of cables. (8)
- (ii) A shunt type ohmmeter has 10 mA basic D'arsonval movement with R_m is 5 Ω and battery emf is 3V. It is desire to modify the circuit by adding appropriate shunt resistance across the movement, so the instrument indicates 0.5 Ω on midpoint scale. Calculate the value of shunt resistances and current limiting resistance. (8)
20. (a) (i) Describe the working of an Anderson's bridge. Derive the equation of balance. (8)
- (ii) Explain the measurement of inductance using Maxwell-Wein's bridge circuit. (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)