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**Question Paper Code: 43505**

B.E. / B.Tech. DEGREE EXAMINATION NOV 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 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 Electrodynamometer 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. 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. The standardization of A.C potentiometer is done by
- directly using a.c standard voltage sources
  - using d.c standard sources and transfer instruments
  - using d.c standard and D'Arsonval galvanometer
  - 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
- Resistance of connecting leads
  - Thermo-electric emfs
  - Contact resistances
  - All the above
8. The value of resistances of an earthing electrode depends upon
- shape and material of electrode
  - depth to which electrode is driven into earth
  - specific resistances of soil
  - value of electrode
9. Maxwell's inductance-capacitance bridge is used for measurement of inductance of
- Low Q coils
  - medium Q coils
  - High Q coils
  - Low and medium Q coils
10. The frequency can be measured using
- Maxwell's bridge
  - Campbell's bridge
  - Wein's bridge
  - Anderson's bridge

PART - B (5 x 2 = 10 Marks)

- Justify how deflection is proportional to square of RMS value of operating current in Moving Iron Instruments.
- Define Phantom loading .
- Why secondary of current transformer should not be open?
- What are the depending factors for any earthing system?
- List the applications of vibration galvanometer.

PART - C (5 x 16 = 80 Marks)

- (a) Explain the principle of working of thermocouple type instruments. Draw the diagram to illustrate the working of contact and non contact type thermo elements. (16)

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) Point out why the phase of shunt is made exactly in  $90^\circ$  out of phase with applied voltage to produce deflecting torque exactly proportional to power. (16)

Or

- (b) Explain the construction, theory and operation of single phase induction type energy meters with neat diagrams. (16)
18. (a) (i) Discuss the construction and working of dry scale 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  $1.5\Omega$  and  $1.0\Omega$  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 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  $\Omega$  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 $\Omega$  on midpoint scale. Calculate the value of shunt resistances and current limiting resistance. (8)

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) Explain the measurement of inductance using Maxwell-Wein's bridge circuit. (16)

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  $1000\text{ Hz}$ . It has following components Arm  $AB = 0.2\mu\text{F}$  Pure capacitance and arm  $BC = 500\Omega$  resistance arm  $DA = 300\Omega$  resistance parallel with  $0.1\mu\text{F}$  Capacitance. Find the constants of arm  $CD$ , Considering as a series circuit. (8)

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