B.E. DEGREE EXAMINATIONS: NOVEMBER 2009

Third Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U07EI 301: Electrical Measurements and Instruments

e: **Three Hours**   **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 × 1 = 10 Marks)

1. If the damping in an d'Arsonval galvanometer is only due to electromagnetic effects, the resistance required for critical damping is

   (a) $G^2/\sqrt{KJ}$ (b) $G/\sqrt{KJ}$ (c) $G/2\sqrt{KJ}$ (d) $G^2/2\sqrt{KJ}$

   G=displacement constant; K=control constant; J=inertia constant

2. Horizontally mounted moving iron instruments use:

   (a) eddy current damping   (b) electromagnetic damping

   (c) fluid friction damping   (d) air friction damping

3. In electrodynamometer type wattmeter, current coils designed for carrying heavy currents use stranded wire to reduce:

   (a) iron losses   (b) hysteresis losses   (c) eddy current losses   (d) copper losses

4. If an induction type energy meter runs fast, it can be slowed down by:

   (a) lag adjustment

   (b) light load adjustment

   (c) by adjusting the position of braking magnet & making it come closer to the center of the disc

   (d) by adjusting the position of braking magnet & making it move away to the center of the disc

5. When potentiometer is used for measurement of voltage of an unknown source, under null conditions the power consumed in the circuit is

   (a) very high   (b) ideally zero   (c) high   (d) small

6. The burden of current transformer is expressed in terms of:

   (a) secondary winding current   (b) primary winding current

   (c) VA rating of transformer   (d) V, I & cosφ of secondary winding

7. In a Kelvin's Double bridge two sets of readings are taken when measuring a low resistance, one with the direction of current and the other with the direction of current reversed. This is done to eliminate,

   (a) the effect of thermoelectric emfs

   (b) the effect of resistance of leads

   (c) the effect of contact resistances

   (d) the effect of changes in battery voltage

8. The value of resistance of an earthing electrode depends upon:

   (a) size of electrode

   (b) specific resistance of soil

   (c) width of electrode is driven into earth

   (d) thickness of electrode

9. Maxwell's bridge is used for measurement of inductance of:

   (a) low Q coils

   (b) high Q coils

   (c) medium Q coils

   (d) low and medium Q coils

10. A vibration galvanometer is to be tuned to a frequency of 50Hz. The ratio of its control constant to inertia constant should be

   (a) 98696   (b) 2500   (c) 10.132×10^{-6} (d) 7892

PART B (10 x 2 = 20 Marks)

11. How a PMMC meter can be used as voltmeter and ammeter?

12. Why are Galvanometer intentionally under damped?

13. How eddy current errors are induced in an electrodynamometer type wattmeter?

14. What is meant by creeping in energy meter?

15. Why DC potentiometers cannot be used for AC measurements straight a way?

16. List the parameters that are affecting the performance of Current Transformer.

17. Classify the resistances from the point of view of measurements.

18. What are the factors which influence the value of earth's resistance?

19. What are the features of a universal impedance bridge?

20. What are the various detectors used in AC bridges?

PART C (5 x 14 = 70 Marks)

21. (a) (i) Explain the working principle of D'Arsonval galvanometer with a neat diagram.

(7)

(ii) A moving coil ballistic galvanometer of $150\,\Omega$ resistance gives a throw of 75 divisions when the flux through a search coil to which it is connected is reversed. Find the flux density in which the reversal of the coil takes place, given that the galvanometer cost = $110\,\mu$ c/div and the search coil has 1400turns, a mean area of 5000mm^2 and a resistance of $20\,\Omega$.

(7)

(OR)

(b) Describe the construction and working of PMMC instrument. Derive the equation for deflection if the instrument is spring controlled.

22. (a) Describe the constructional details of an electrodynamometer type wattmeter with a neat diagram.

(OR)

(b) Describe the constructional details of a $1\,\phi$ induction type energy meter. Also, explain how the deflecting torque exactly proportional to power.

23. (a) Describe the construction and working of a Drysdale type potentiometer. How is it standardized? Also, explain how an unknown Voltage can be measured by using this potentiometer?

(OR)

(b) Describe the design and constructional features used in current transformers to reduce the errors due to various sources.

24. (a) Draw and explain the circuit of a Wheatstone bridge. Also, explain how the effects of precision measurement of medium resistance are minimized?

(OR)

(b) Describe the fall of potential method for measurement of earth resistance. Explain how the earth tester is used for measurement of resistance of an earthing electrode.

25.(a) What are the different sources of errors in AC bridges? Explain the precautions taken and the techniques used for minimization of these errors?

(OR)

(b) Derive the equations of balance for an Anderson's bridge. Draw the phasor diagram for conditions under balance. Discuss the advantages and disadvantages of the bridge.

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