Code: R7310202

R7

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013

ELECTRICAL MEASUREMENTS

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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1 (a) Define limiting errors. Derive the expression for relative limiting errors.

(b) A 0-150 V voltmeter has a guaranteed accuracy of 1 percent of full-scale reading. The voltage measured by this instrument is 75 V. Calculate the limiting error in percentage.

2 (a) Draw the equivalent circuit and phasor diagram of a current transformer and derive the expression for ratio error.

(b) The primary winding exciting current of a current transformer with a bar primary, nominal ratio 100/1, operating on an external burden of 1.6 Ω non-inductive, the secondary winding resistance being 0.2 Ω is 1.9 A, lagging 40.6^{o} to the secondary voltage being reversed there being 100 secondary turns. With 1 A flowing in the secondary winding. Calculate:

(i) The actual ratio of primary winding current to the secondary winding current.

(ii) The phase angle between them in minutes.

3 Describe the constructional details and working principle of the single-phase dynamometer wattmeter.

4 (a) Explain the phenomenon of creeping? And derive the expressions for driving and braking torques of a single-phase induction type energy meter.

(b) If an energy meter makes 10 revolutions on 100 sec when a load of 360 W is connected to it, determine the meter constant in revolutions/KWh?

Contd. in Page 2

Code: R7310202

R7

5 (a) Explain how an unknown resistance can be measured by using D.C Crompton's potentiometer.

(b) A basic slide wire potentiometer has a working battery voltage of 3 V with negligible internal resistance. The resistance of slide wire is 400 ohms 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 up to 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: (i) Working current.
(ii) The resistance of series rheostat.
(iii) The measurement range.
(iv) The resolution of instrument.

6 (a) Define sensitivity and derive the expression for sensitivity of a Wheat stone bridge with equal arms.

(b) In the Wheatstone bridge, the values of resistances of various arms are P = 1000 Ω, Q = 100 Ω, R = 2005 Ω and S = 200 Ω. The condition for balance of Wheatstone bridge is QR = PS. The battery has an e.m.f of 5 V and negligible internal resistance. The galvanometer has a current sensitivity of 10 mm/μA and an internal resistance of 100 Ω. Calculate the deflection of galvanometer and the sensitivity of the bridge in terms of deflection per unit change in resistance.

7 (a) Derive expression for frequency in terms of bridge parameters for Wein's bridge.

(b) Explain the Anderson's bridge with a neat phasor diagram.

8 Prove that in a ballistic galvanometer, the charge is proportional to the first swing of the moving coil.

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