DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

00837

Term-End Examination

June, 2014

BIEE-039 : ELECTRICAL MEASUREMENTS AND INSTRUMENTS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions in all. All questions carry equal marks. Question no. 1 is **compulsory**. Missing data if any may be suitably assumed. Use of calculators is permitted.*

1. Choose the best alternative. *7×2=14*

(a) In measurement systems, which of the following are undesirable static characteristics ?

(i) Sensitivity and Accuracy

(ii) Drift, static error and dead zone

(iii) Reproducibility and non-linearity

(iv) Drift, static error, dead zone and non-linearity

(b) Fluid friction damping can be used in

(i) horizontally mounted instruments

(ii) vertically mounted instruments

(iii) both horizontally and vertically mounted instruments

(iv) None of the above

(c) The moving iron voltmeters indicate

(i) same value for dc and ac voltages

(ii) lower values for ac voltages than for corresponding dc voltages.

(iii) higher values for ac voltages than for corresponding dc voltages.

(iv) None of the above

(d) The transformation ratio in the case of potential transformer is defined as the ratio of

(i) Primary winding voltage / Secondary winding voltage

(ii) Rated primary winding voltage / Rated secondary winding voltage

(iii) Number of turns of primary winding / Number of turns of secondary winding

(iv) All of the above

(e) If an induction type Energy meter runs fast, it can be slowed down by

(i) lag adjustment

(ii) light load adjustment

(iii) adjusting the position of braking magnet and making it come close to the centre of the disc

(iv) adjusting the position of braking magnet and making it move away from the centre of the disc

(f) An Aquadag is used in a CRO to collect

(i) primary electrons

(ii) secondary emission electrons

(iii) both primary and secondary emission electrons

(iv) None of the above

(g) A phase sequence indicator rotates clockwise for phase sequence of RYB. If the phase sequence is changed to BRY, it will rotate

(i) Anticlockwise

(ii) Clockwise

(iii) Clockwise or anticlockwise

(iv) None of the above

2. (a) Define the following terms :

(i) Repeatability

(ii) Accuracy

(iii) Precision

(iv) Static Sensitivity

(v) Resolution

(vi) Linearity

(vii) Draft

(b) Describe the various operating forces needed for proper operation of an analog indicating instrument. *2×7=14*

3. (a) With the help of neat diagram, explain the construction and working of PMMC instrument. How is the range of a PMMC instrument extended with the help of shunts ?

(b) A moving iron instrument has full scale current of 100 mA. It is converted into a 250 V voltmeter using a series resistance of a material having negligible resistance temperature coefficient. The meter has a resistance of 320 Ω at 20°C. After carrying a steady current of 100 mA for a long time, the resistance of the coil increases to 369 Ω due to self-heating. Calculate the error due to self-heating when a voltage of (i) 250 V and (ii) 125 V is applied continuously. *2×7=14*

4. Describe the construction details of a single phase induction type energy meter. Also derive the expression for deflecting torque in single phase induction type energy meter. Show that the deflection is maximum when the phase angle between two fluxes is 90° and when the disc is purely non-inductive. *14*

5. (a) Draw the block diagram of a general purpose CRO and explain the functions of the following controls :

   (i) Intensity

   (ii) Focus

   (iii) Horizontal and Vertical positioning

   (iv) Synchronization

   (b) Describe how (i) Frequency and (ii) Phase angle measurements can be made with the help of a CRO. *2×7=14*

6. (a) Explain how power can be measured in a three phase circuit with the help of two wattmeters. Illustrate your answer with the help of a phasor diagram for a balanced star connected load.

(b) Comment upon the readings of the two wattmeters under the following conditions : (Assume a star connection)

(i) when the power factor is unity

(ii) when the power factor is zero lagging

(iii) when the power factor is 0·5 lagging

(iv) when the power factor is 0·3 lagging

2×7=14

7. Write short notes on any ***two*** of the following : *2×7=14*

(a) Single phase power factor meter

(b) Current Transformer (CT)

(c) Dynamometer type frequency meter

(d) Tong tester