No. of Printed Pages : 6

BIEE-039

DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

Term-End Examination

00635

December, 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 may be suitably assumed. Use of calculators is permitted.*

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

(a) A megger is used for measurement of

(i) Low valued resistance

(ii) Medium valued resistance

(iii) High valued resistance particularly insulation resistance

(iv) All of the above

(b) A moving iron instrument can be used for current and voltage measurements in

(i) a.c. circuits only.

(ii) d.c circuits only.

(iii) both a.c. and d.c circuits for any value of frequency (in case of a.c. circuits).

(iv) both a.c. and d.c circuits for frequency up to 125 Hz (in case of a.c. circuits).

(c) The burden of current transformer is expressed in terms of

(i) Secondary winding current

(ii) VA rating of transformer

(iii) Voltage, current and power factor of secondary winding circuit

(iv) None of the above

(d) The controlling torque in single-phase power factor meter is provided by

(i) Spring control

(ii) Gravity control

(iii) Stiffness of suspension

(iv) None of the above

(e) An electrodynamometer type instrument is used in Weston type synchroscope while synchronizing an incoming machine to bus bars

(i) for checking the power factor of the two circuits.

(ii) for checking the voltages of the two circuits.

(iii) for checking whether the incoming machine is fast or slow.

(iv) for checking the phase sequence of the two circuits.

(f) A Merz Price Maximum demand indicator indicates

(i) Maximum demand

(ii) Average maximum demand over a specified period of time

(iii) Maximum energy consumption

(iv) All of the above

(g) In a Cathode Ray Tube (CRT) the focussing anode is located

(i) between pre-accelerating and accelerating anodes.

(ii) after accelerating anode.

(iii) before pre-accelerating anode.

(iv) None of the above

2. (a) Explain the terms "Indicating instruments", "Recording instruments" and "Integrating instruments". Give examples for each type.

(b) Why is controlling torque necessary in an analog indicating instrument ? What would happen in the absence of a controlling torque ? *2×7=14*

3. (a) Describe the constructional details of an attraction type moving iron instrument with the help of a neat diagram. Derive the equation for deflection if spring control is used. Comment on the shape of the scale. Give the methods adopted to linearize the scale.

(b) A moving coil instrument gives a full scale deflection of 10 mA when the potential difference across its terminals is 100 mV. Calculate

(i) the shunt resistance for a full scale deflection corresponding to 100 A.

(ii) the series resistance for full scale reading with 1000 V. Calculate the amount of power dissipated in each case. *2×7=14*

4. (a) A 230 V, single-phase, watt hour meter has a constant load of 4 A passing through it for 6 hours at unity pf. If the disc makes 2208 revolutions during this period, what is the meter constant in revolutions per kWh ? Calculate the power factor of the load if the number of revolutions made by the meter are 1472 when operating at 230 V and 5 A for 4 hours.

(b) Explain how the following adjustments are made in a single-phase induction type energy meter :

(i) Adjustment for friction compensation

(ii) Overload compensation *2×7=14*

5. (a) Describe the functions of the essential components of a CRO with the help of a block diagram.

(b) Explain how

(i) an a.c. voltage is measured with a CRO.

(ii) dielectric losses are measured with a CRO. *2×7=14*

6. Show that in the two wattmeter method of power measurement, sum of the two wattmeter readings is equal to the total power consumed by the load. Also show that the power factor is given by

$$\cos \phi = \cos\left(\tan^{-1} \sqrt{3} \frac{W_1 - W_2}{W_1 + W_2} \right)$$

where W_1 and W_2 are the two wattmeter readings. *14*

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

(a) Potential Transformer

(b) Synchroscope

(c) Megger

(d) Earth Tester