Third Semester Examination – 2010

ELECTRICAL & ELECTRONICS MEASUREMENT

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) Current of 2.50 A is flowing through a resistor of 15.35 ohm. Calculate the voltage drop across the resistor to the appropriate number of significant figures.

   (b) Distinguish between "Systematic error" and "Random error".

   (c) Write the procedure of taking into account the effect of thermoelectric e.m.f. in Wheatstone bridge.

   (d) Why Maxwell's bridge for measurement of inductance is not suitable for high Q value?

   (e) How the construction of Ballistic galvanometer is different from D'Arsonval type of galvanometer?

   (f) Suggest an instrument for measurement of d.c. voltage accurately. Justify your answer.

   (g) What will happen, if the secondary of a current transformer is made open while the primary is energized?

(h) Why an oscilloscope is used for displaying high frequency voltages in stead of electromechanical instruments?

(i) Write the basic principle of operation of True r.m.s. voltmeter.

(j) Define "Harmonic Distortion" and "Total Harmonic Distortion".

2. (a) An unknown resistance is measured using ammeter and voltmeter method. The voltmeter is connected across the unknown resistor which reads 10 V. The current through the unknown resistor is 5 A. If the resistance of the voltmeter is 20 ohm, find the value of the unknown resistance.   5

(b) Three voltmeters are employed for the measurement of resistance and inductance of a coil under test. Draw the vector diagram and derive the expressions of resistance and inductance of the coil.   5

3. (a) Draw the circuit diagram and phasor diagram at balance of Hay's bridge. Derive the expression of the unknown inductance and effective resistance of the coil. Describe the method of obtaining balance.   5

(b) What are the detectors used in a.c. and d.c. bridges ? How these detectors indicate the unbalance and balance conditions of the bridge circuits ?   5

4. (a) Show that the deflection of an under-damped D'Arsonval type galvanometer is oscillatory and the amplitude of oscillation decreases as time increases.   5

(b) Derive the expression of deflecting torque of moving iron instrument. Comment on shape of scale of the instrument.   5

5. (a) Describe the method of calibration of a d.c. potentiometer. What are the precautions to be observed for ensuring accuracy during measurement?   5

(b) Describe the construction, theory and principle of operation of electro-dynamometer type wattmeter. 5

6. (a) Draw a basic d.c. voltmeter circuit with FET input and describe its operation. Explain the method of calibration and zero adjustment of the voltmeter. How the range of the voltmeter is adjusted? 5

(b) Describe the construction and theory of a Potential Transformer. 5

7. (a) Draw the block diagram of a general purpose oscilloscope and describe the operation and importance of each block. 5

(b) Draw the functional block diagram of a heterodyne wave analyzer and describe its operation. 5

8. Write short notes on any *two* of the following : 5×2

(a) Measurement of galvanometer constants

(b) Frequency meter (Any one method)

(c) Digital storage oscilloscope.