Third Semester B.E. Degree Examination, December 2010
Electrical Measurements

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Derive the dimensions of resistance, inductance and capacitance in LMTI system. **(06 Marks)**

   b. The expression for mean torque of electrodynamometer type wattmeter may be written as :

$$T_d \propto M^a \, E^b \, Z^c$$

   where M = mutual inductance between fixed and moving coils,
   E = applied voltage,
   Z = impedance of load circuit.
   Determine the valves of a, b, c from the dimensions of the quantities. **(10 Marks)**

   c. Explain the Kelvin's double bridge and the balance condition equation. **(04 Marks)**

2 a. Define the sensitivity of Wheatstone's bridge, with the necessary circuit diagram. Hence deduce the expression for sensitivity of the bridge 'S_B'. **(08 Marks)**

   b. Obtain the balance equation for Schering bridge used for the measurement of capacitance. Draw the phasor diagram at the balanced condition. **(08 Marks)**

   c. An Anderson bridge is arranged as follows. Branch AB is an inductive resistor ; branches BC and AD are variable non-reactive resistors; branches CD and DA are non-reactive resistors of 200 Ω each; branch CE is a 1 μF capacitor. The supply is connected between A and C while the detector is connected between B and ᴇ. Balance is obtained when the resistance of BC is 400 Ω and that of DE is 500 Ω. Determine the unknown inductance and its resistance of inductive resistor in the branch AB. **(04 Marks)**

3 a. Write the advantages of C.T and P.T over shunts and multipliers. **(06 Marks)**

   b. A moving coil meter gives a full scale deflection with a current o 5 mA. If the coil of the instrument has the resistance of 10Ω, show that it can be adopted to work as :
   i) Ammeter of range 0 – 10 A
   ii) Voltmeter of range 0 – 10 V. **(06 Marks)**

   c. Explain the current transformer with the help of an equivalent circuit diagram and a phasor diagram. Write expression for ratio error and phase angle error. **(08 Marks)**

4 a. Explain the construction and working principle of electrodynamometer wattmeter for the measurement of power in the circuit. **(08 Marks)**

   b. Explain the calibration and adjustments of the single phase induction type energy meter. **(08 Marks)**

   c. A wattmeter has a current coil of resistance 0.2 Ω and a pressure coil of resistance 5000Ω. It is connected to measure the power consumed by a load. Calculate the percentage error in the reading of the wattmeter, when the load takes 20 A, at 250 V with 0.8 pF and when :
   i) The pressure coil is connected on the supply side
   ii) The current coil is connected on the supply side. **(04 Marks)**

PART – B

5 a. With the help of a neat diagram, explain the construction and working of an electrodynamometer power factor meter. (10 Marks)
   b. Explain the digital voltmeters, using successive approximation method. (10 Marks)

6 a. Explain the static phase sequence indicator, with the help of a diagram. (08 Marks)
   b. With the block diagram, explain the principle of true R.M.S responding voltmeter. (06 Marks)
   c. Explain with the help of a diagram, the operation of x-y recorders. (06 Marks)

7 a. With a neat block diagram, explain the working of digital storage oscilloscope. (10 Marks)
   b. Explain the operation of a electric multimeter to measure current, voltage and resistance. (10 Marks)

8 a. Briefly explain the basic elements of a digital acquision system. (06 Marks)
   b. Explain the operation of a LVDT, with the help of a diagram. (06 Marks)
   c. What is a transducer? Briefly explain the photoconductive and photovoltaic cells. (08 Marks)

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