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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 electro-dynamometer 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 values 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 E. 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 of 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 electro-dynamometer 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 electro-dynamometer 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 acquisition 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)
