GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-II [All Branch] examination June 2009

Subject code: 110005
Subject Name: Elements of Electrical Engineering
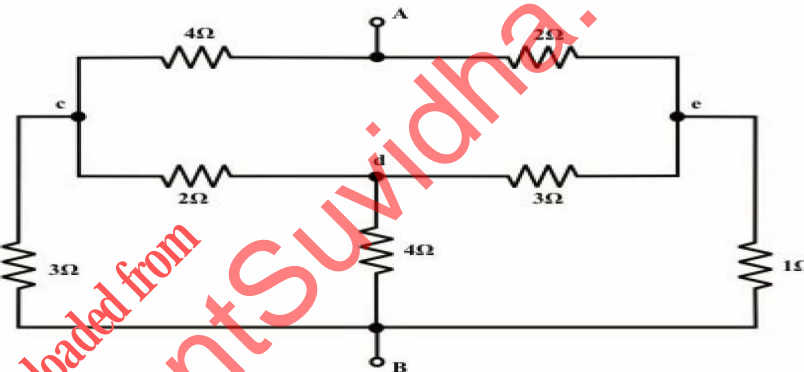
Date: 12/06/2009   **Time: 10:30am-1:00pm**
Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Prove $R_{t2} = R_{t1} [1 + \alpha_1 (t_2-t_1)]$, where notations have usual meanings. **05**

(b) Determine the equivalent resistance between the terminals *A and B* of **05** network shown in figure 1.

Figure 1

(c) Explain KCL and KVL. **04**

Q.2 (a) Derive an expression for the equivalent capacitance of parallel plate **07** capacitors when they are connected in (i) series and (ii) Parallel.

(b) A 10 μF capacitor is connected in series with a 1M Ω resistor. This **07** combination is connected across a 100V D.C. supply determine (i) time constant of the circuit (ii) the initial value of the charging current (iii) the initial rate of rise of voltage across the capacitor (iv) time taken for the capacitor voltage to reach 60 V.

OR

(b) A circular ring of mild steel has diameter of 20 cm and 2.0 mm side **07** air gap. The cross section area is 3.2 cm^2 Estimate the M.M.F required to establish 0.6 mWb flux. Assume relative permeability of mild steel = 900.

Q.3 (a) Compare Electric and Magnetic circuit. **05**

(b) Distinguish statically induced and dynamically induced EMF. Derive **05** expression for dynamically induced EMF.

(c) (i) Explain Magnetic Hysteresis. (ii) What do you understand by **04**

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coefficient of coupling between two magnetic coils.

OR

Q.3 (a) Derive the expressions of equivalent inductance, when two magnetically coupled coils are connected in series in two different ways. **05**

(b) State and explain Faraday's laws of electromagnetic induction. **05**

(c) Explain the term (i) reluctance (ii) permeability **04**

Q.4 (a) A series RLC circuit having resistance of 8 Ω, inductance of 80 mH and capacitance of 100 μF is connected across 150 V, 50 Hz supply (Fig. 2). Calculate,(a) the current, (b) the power factor, and (c) the voltages drops in the coil and capacitance. **07**
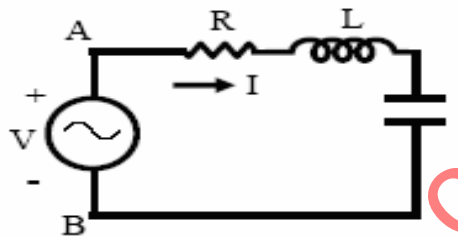

FIG 2

(b) Define following terms in connection with A.C wave forms : (i) Frequency (ii) phase & phase defference (iii) Time Period (iv) form factor (v) R. M. S. Value (vi) Average Value **07**

OR

Q. 4 (a) The circuit, having two impedances of Z_1= 8 + j15 Ω and Z_2= 6 - j8 Ω in parallel, is connected to a single phase ac supply and the current drawn is 10 A. Find each branch current, both in magnitude and phase, and also the supply voltage. **07**

(b) Define the term (1) reactance, (2) inductive reactance and (3) capacitive reactance and explain how it depends on frequency in an A. C. circuit. **07**

Q.5 (a) Derive an expression for the total power for a balanced 3 phase star OR delta connected load in terms of line voltage line current and power factor. **06**

(b) What is earthing? Explain requirement of earthing for any electrical equipment. **04**

(c) Draw the wiring diagram for the staircase wiring. **04**

OR

Q.5 (a) List various protective devices used in the electric circuits and compare working of ELCB with MCB. **06**

(b) How do you estimate the life of a battery when charging and discharging characteristics are available? **04**

(c) List lumens requirements for various categories of illumination. **04**

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