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Level	BE	Full Marks	80
Programme	BCE, BME, BGE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering (EE 451)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. a) What is electric current? How the concept of electric current was originated. [4]

   b) The filament of a 60W, 230V lamp has a normal working temperature of 2000°C. Take the temperature coefficient to be 0.005 at room temperature 20°C. Find the current which flows at the instant of switching on the supply to the cold lamp. [6]

   c) Define the terms power and energy and state their practical units.
   What is monthly energy consumption and the monthly electrical charges of using the following electrical equipment at Rs 7 per kWh?

      (i) Ten 1200Watt heaters for 5 hours
      (ii) Six 50 Watt TV for 4 hrs.
      (iii)Five 400 Watt fans for 10 hours.
   (iv)4800Watt electric clothes dryer for 2 hours. [2+4]

2. a) Using mesh analysis determine the current through all the resistors. [6]
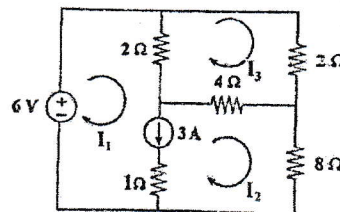
   b) Using thevenin's theorem find the current flowing through load resistance of value 1Ω connected across terminals ab for the network shown below. [6]
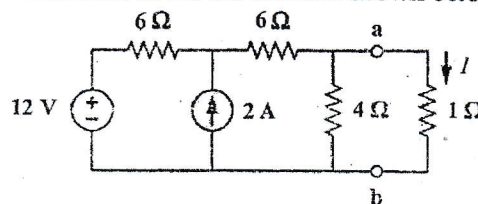
   c) Explain reciprocity theorem with example. [4]

3. a) Use nodal analysis to find the current through 4Ω resistor for the network shown below. [8]
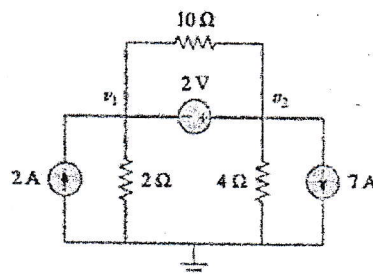
b) Prove the total equivalent inductance of two inductive coils joined in series will be Leq = L_1+L_2-2M, where L_1 and L_2 are coefficient of self-inductance of 1st and 2nd coil and M is the coefficient of mutual inductance. [4]

c) Find the form factor and peak factor of sinusoidal voltage v = 10 Sin(wt). [4]

4. a) A coil and non-inductive resistor are connected in series across a 200V, 50Hz supply. The voltages across the coil and resistor are 120V and 140V respectively. If the supply current is 0.5A, calculate (i) the resistance and inductance of the coil; (ii) the power dissipated in the coil; (iii) the power factor of the coil; (iv) the power factor of the circuit. [8]

b) A RC series circuit (R_1 = 40Ω, C = 10μF) and RL series circuit (R_2 = 50Ω, L = 0.2Ω) are connected in parallel to each other and a source of 100V, 50Hz is applied across the overall circuit. Calculate (i) current drawn by each branch and overall current taken from supply (ii) power factor of circuit (iii) Active , Reactive and Apparent power [8]

5. a) Three impedances of (10+j10)Ω, (12+j12)Ω and (2+j2)Ω are connected in delta to a 3-phase system with line voltage 400V. Calculate all the phase currents, line currents, active powers, reactive powers and apparent power. [8]

b) How can we measure the power factor angle of the circuit using two wattmeter power measurement method? [8]

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