05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baishakh

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

Subject: - Basic Electrical Engineering *(EE451)*

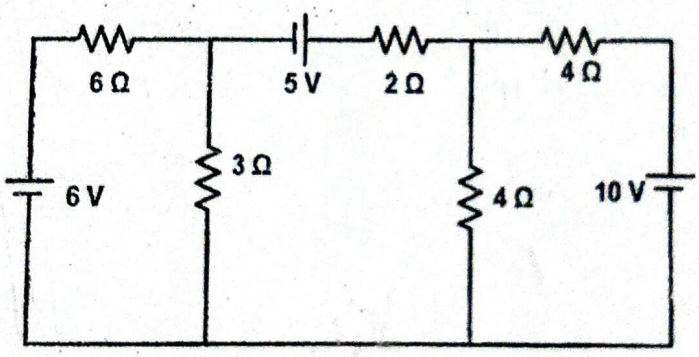
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Derive a relation between the known resistance R_1 at t_1 °C and the unknown resistance R_2 at t_2 °C, when α_0 is not known. [6]

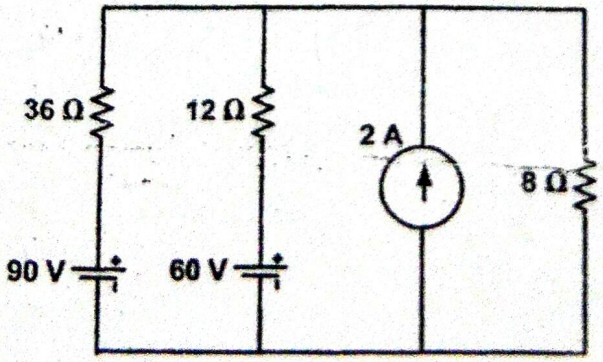
   b) Explain the process of source conversion. How is it helpful in solving electrical networks? [4]

   c) A circuit, containing of three resistances 12 Ω, 18 Ω, and 36 Ω respectively jointed in parallel, is connected in series with a fourth resistance. The whole is supplied at 60 V and it is found that the power dissipated in the 12 Ω resistance is 36 W. Determine the value of the fourth resistance and the total power dissipated in the group. [6]

2. a) Find the branch currents in the circuit of given figure below by using nodal analysis? [6]

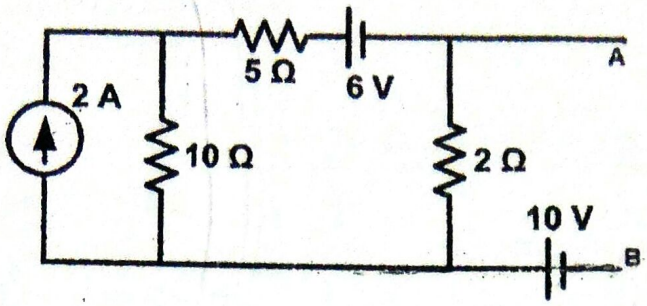


   b) Find current in 8 Ω resistor of the network shown in figure below using superposition theorem. [6]



   c) State and explain Thevenin's theorem with suitable example. [4]

3. a) In the network shown in figure below, find resistance R_L connected between terminals A and B so that maximum power is develop across R_L. What is the maximum power? [6]



b) Derive an expression for the energy stored in the magnetic field of an inductor. [4]

c) Derive an expression for the current drawn by a pure capacitor when connected across a voltage. Explain with the help of a power diagram that the value of average power drawn by the capacitor during one cycle is zero. [6]

4. a) A resistance of 20 Ω, an inductance of 0.2 H and a capacitance of 100 μF are connected in series across a 220 V, 50 Hz supply. Determine the following (a) impedance (b) Current (c) Voltage across R, L and C and (d) Power factor. Also calculate the total power consumed by the circuit. [6]

b) A coil resistance 50 Ω and inductance 0.318 H is connected in parallel with a circuit comprising a 75 Ω resistor in series with a 159 μF capacitor. The resulting circuit is connected to a 240 V, 50 Hz ac supply. Calculate: (a) The supply current (b) The circuit impedance, resistance and reactance (c) Power factor and (d) Total power consumed by the circuit. [6]

c) Describe the method of measuring power in 3-Φ circuit by using two watt meters. [4]

5. a) A 220 V, 50 Hz single phase ac motor draws a power of 10 kW at a power factor of 0.75 lagging. Calculate the change in current taken from the supply and the new power factor when a 250 μF capacitor is connected in parallel with the motor. If the motor is supplied through a cable of 0.05 Ω resistances, calculate the power loss in the cable before and after connecting the capacitor. [8]

b) A three-phase Δ-connected load consists of three similar coils, each of resistance 50 Ω and inductance 0.3 H. The supply is 415 V, 50 Hz. Calculate (i) The line currents (ii) The power factor (iii) Total active and reactive powers when the load is Δ-connected. Draw the phasor diagram. [8]

***