05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Magh

Exam.	New Back (2066 & Later Batch)		
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) Differentiate between electromotive force and potential difference. What do you mean by ideal and practical current and voltage sources? [2+2]

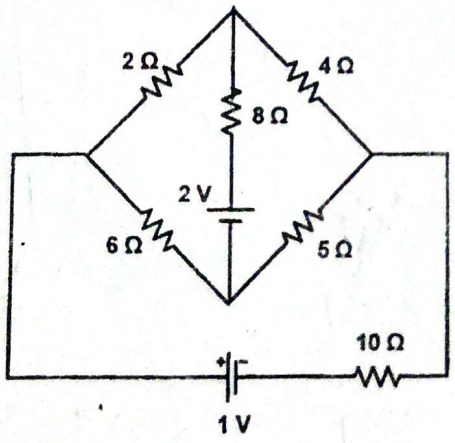
   b) Two resistors, made of different materials having temperature coefficients of resistance $\alpha_1 = 0.004$ / °C and $\alpha_2 = 0.005$ / °C, are connected in parallel and consume equal power at 15°C. What is the ratio of power consumed in resistance R_2 to that in R_1 at 70°C? [6]

   c) Define the terms power and energy and state their practical units.

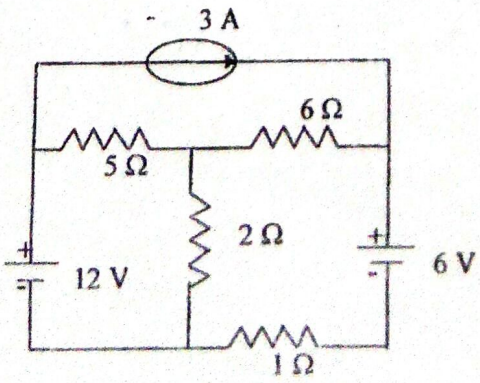
   What is the total cost of using the following at Rs. 7 per kWh?

   (i) A 1200 Watt toaster for 30 minutes.
   (ii) Six 50 Watt bulbs for 4 hrs.
   (iii) A 400 Watt washing machine for 45 minutes.
   (iv) 4800 Watt electric clothes dryer for 20 minutes. [6]

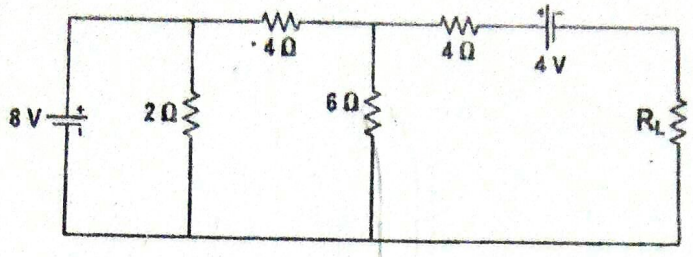
2. a) Find Current in 1 V source of the network shown in figure below, using Superposition theorem. [8]



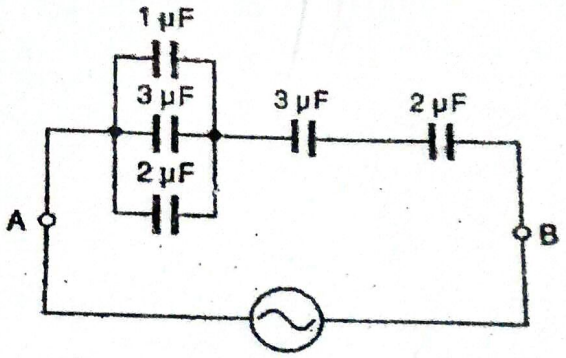
   b) Use nodal analysis to find the current through 6Ω resistor for the network shown below. [8]



3. a) Find the value of R_L for which the maximum power is transferred in the load resistance R_L. Also find the maximum power that can be transferred to the load resistance R_L circuit shown in figure below. [8]



b) Calculate the equivalent capacitance of the circuit shown below across the point AB. [4]



c) Define average value and rms value of voltage in 1-phase sinusoidal a.c. system. [4]

4. a) An inductive coil with impedance $Z_1 = (8+j4)\ \Omega$ is connected in parallel with a capacitive circuit having an impedance of $Z_2 = (6-j7.5)\ \Omega$, is connected in series with an inductive coil $Z_3 = (2.8+j6.1)\ \Omega$. Find (i) total impedance, (ii) total circuit current and branch currents, (iii) power taken by each impedance and the total power, (iv) overall power factor and (v) voltage drop across each impedance. [8]

b) A single phase a.c. voltage of 100 s in (314t-30°)v is supplying a circuit consisting of two parallel branches. Current through the parallel branches are 10sinwt A and 15sin (wt-60°)A. determine rms value of current drawn from the circuit and construct phasor diagram of current and voltages. What is the equivalent impedance of the circuit? [3+3+2]

5. a) Three non-inductive loads of 8 kW, 6 kW and 4 kW are connected between the neutral and the red, yellow and blue phase respectively of a 3 phase 4 wire system with line voltage of 400 V. Find out (i) current in each line and (ii) the current in neutral conductor. [8]

b) A single phase 50 Hz motor takes 20 A at 0.75 power factor lagging from a 230 V sinusoidal supply. Calculate the kVar and capacitance of capacitor to be connected in parallel to raise the power factor to 0.9 lagging. What is the new supply current? [8]

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