05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Bhadra

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

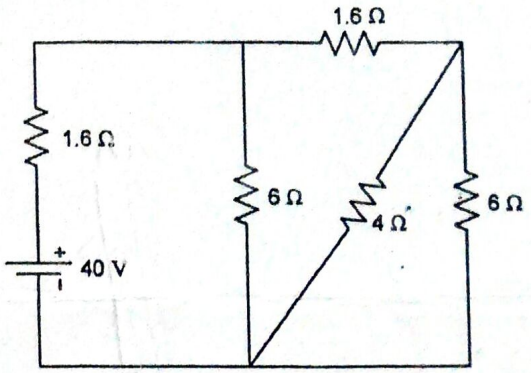
Subject: - Basic Electrical Engineering

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

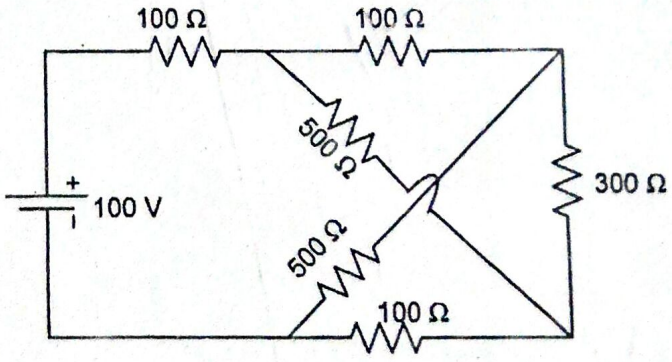
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristics. [2+3]

   b) The coil of a relay takes a current of 0.12A when it is at the room temperature of 15°C and connected across a 60-V supply. If the minimum operating current of the relay is 0.1A, calculate the temperature above which the relay will fail to operate when connected to the same supply. Resistance-temperature coefficient of the coil material is 0.0043 per °C at 6°C. [6]

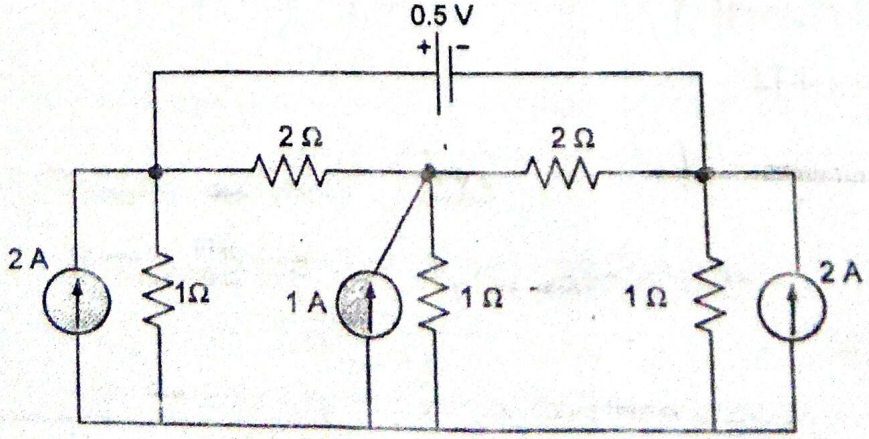
   c) Find the current through 4Ω resistance. [5]



2. a) State and explain Kirchoff's laws. Determine the current supplied by the battery in the circuit shown in figure below. [2+4]

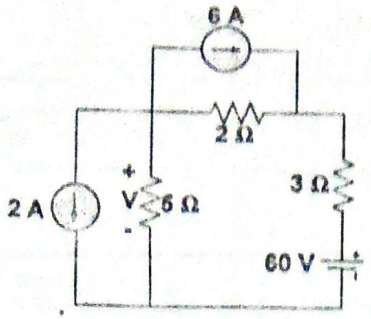


   b) Obtain the voltages at each nodes by applying nodal voltage analysis. [6]

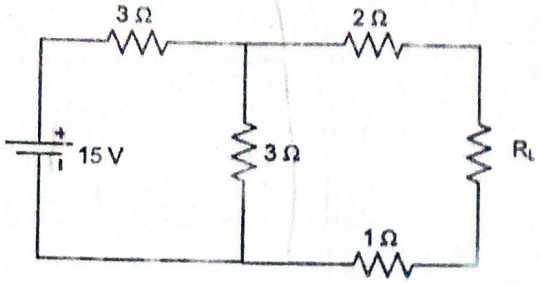


   c) State and explain Norton's theorem with an appropriate example. [4]

3. a) State superposition theorem. Apply superposition theorem to the circuit shown below to find the voltage drop V across the 5Ω resistor. [8]

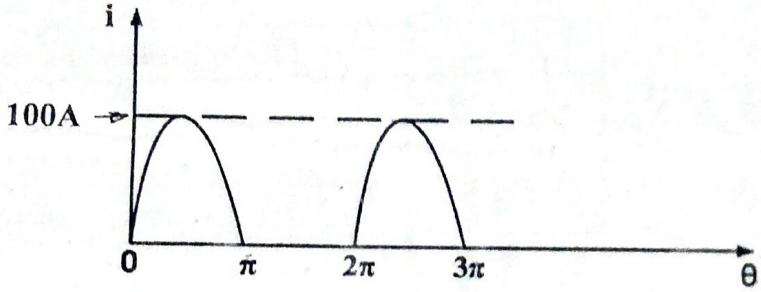


b) Find the value of R_L such that maximum power will be transferred to R_L. Find the value of the maximum power. [8]



4. a) Derive the equation for instantaneous current flowing through a pure capacitor when excited by AC sinusoidal voltage $v = V_m \sin\omega t$. Draw the waveform of voltage and current and phasor diagram of the circuit. Show analytically and graphically that it does not consume real power. [4]

b) Calculate the RMS and average values of the rectified sine wave of 50Hz. [6]



c) Two coils A and B are connected in series across a 240V, 50Hz supply. The resistance of A is 5Ω and the inductance of B is 0.015H. If the input from the supply is 3 kW and 2 kVAR, find the inductance of A and the resistance of B. Calculate the voltage across each coil. [6]

5. a) Two impedances consists of (resistance of 15Ω and series connected inductance of 0.04H) and (resistance of 10Ω, inductance of 0.1 H and a capacitance of 100 μF, all in series) are connected in series and are connected to a 230V, 50Hz a.c. source. Find: (i) current drawn, (ii) voltage across each impedance, (iii) total power factor and (iv) draw the phasor diagram. [6]

b) What are the two ways of connecting a 3-phase system? Draw their phasor diagrams and write down the relationship between phase and line voltages and currents for these systems. [4]

c) Define power factor and explain the disadvantages and causes of low power factor? [6]

6. a) List out the advantages of 3 phase system over single phase system. [4]

b) Explain 2-wattmeter method for the measurement of power in a balanced three phase load. How are the readings of the two wattmeters affected, when the load power factors is very low. [6]

c) A 220V, 3-phase voltage is applied to balanced delta connected 3-phase load of phase impedance $(15 + j20)\Omega$. Calculate: [6]

i) The phase voltages
ii) The power current in each line
iii) The power consumed per phase
iv) Draw the phasor diagram
v) What is the phasor sum of three line currents? Why does it have this value?

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