06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BME, BGE	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

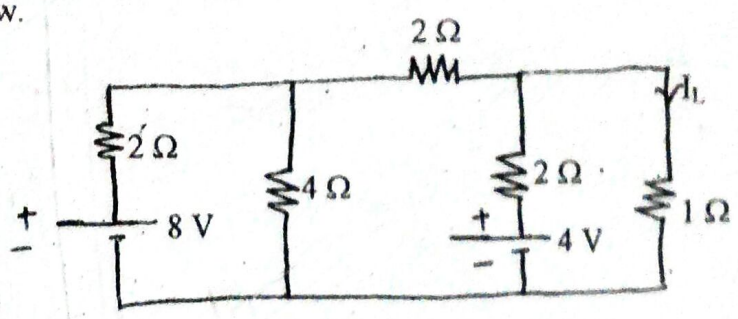
Subject: - Basic Electrical Engineering *(EE451)*

- ✓ 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) At room temperature of 20°C, the current flowing at the instant of switching of a 40W filament lamp with 220V supply is 2A. The filament material has a resistance temperature coefficient of 0.005/°C at 20°C. Calculate the working temperature of filament and current taken by it during normal working condition. [6]

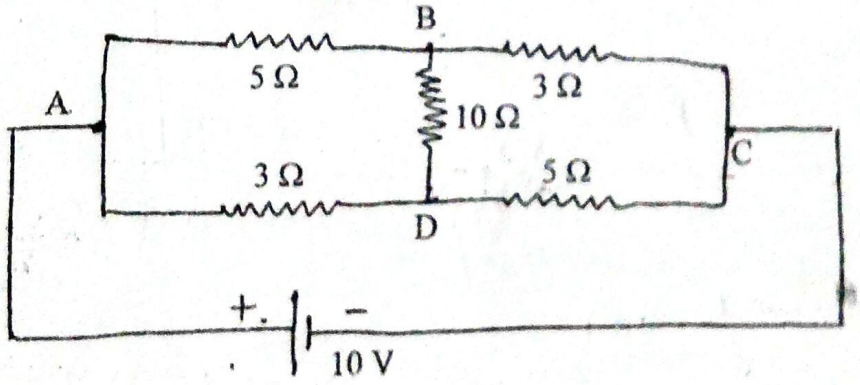
   b) Derive the formula $I = n.A.e.V$ where the symbols used have their usual meaning. [5]

   c) Apply KVL and KCL to determine current I_L through 1Ω resistor in the network shown below. [5]



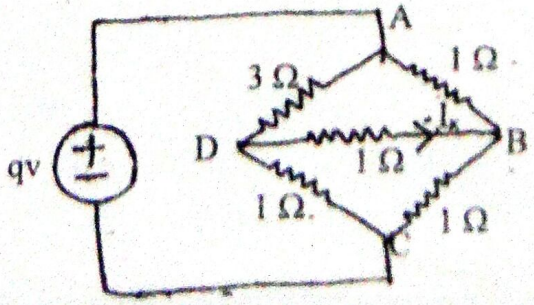
2. a) Define maximum power transfer theorem and derive the condition for maximum power transfer across the load resistance. [8]

   b) Find the current in t he branch BD of the circuit given below by using Thevenin's. [8]



3. a) Derive the equation for instantaneous current flowing through a pure inductor when excited by an ac sinusoidal voltage $v = v_m \sin wt$. Draw the wave form of voltage and current and also show analytically and graphically that it does not consume real power. [8]

   b) Find the value of I_x in the circuit shown below by the method of nodal analysis. [8]



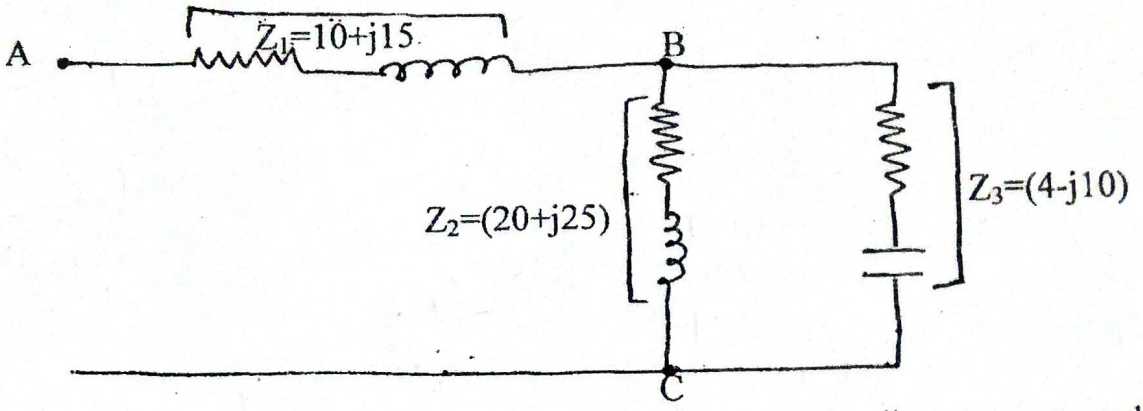
4. a) What do you understand by dynamically and statically induced emfs? Hence define self and mutually induced emf and magnetic coupling between two coils. [4]

b) Derive an expression for the equivalent inductance of two inductors when they are connected in series (i) adding combination (ii) Opposing combination [6]

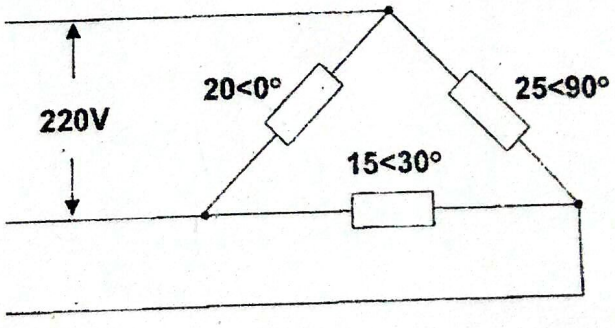
c) A 10 Ω resistor is connected in series with a 100μF capacitor to a 230 V, 50 Hz supply. Find (i) The impedance (ii) Current (iii) Power factor (iv) Phase angle (v) Voltage across the resistor and the capacitor. [6]

5. a) Three elements, a resistance of 100 Ω, an inductance of 0.1H and a capacitance of 150 μF are connected in parallel to a 230 V, 50 Hz supply. Calculate the : (i) Current in each element (ii) Supply current (iii) Phase angle between the supply voltage and the supply current with the help of a phasor diagram. [6]

b) In the circuit shown in figure below, determine the equivalent impedance that appears across the terminals AC. [4]



c) For the 3-phase delta connected circuit below. Determine the line currents and total active, reactive and apparent power. [6]



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