05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Magh

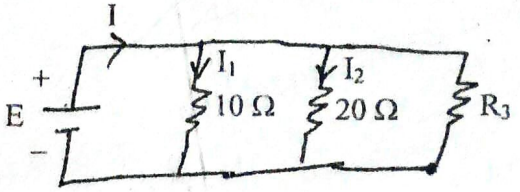
Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME	Pass Marks	32
Year / Part	I / II	Time	3 hrs.

Subject: - Basic Electrical Engineering *(EE451)*

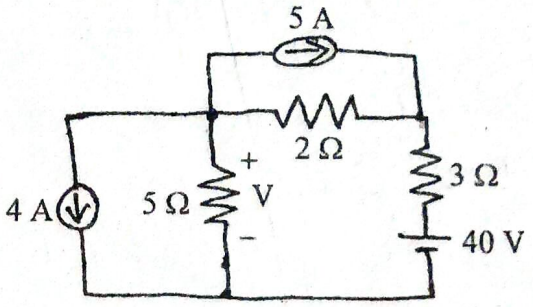
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) A coil connected to a constant DC supply of 100 V drew a current of 13 A at room temperature of 25°C. After some time, its temperature increased to 70°C and current fell to 8.5 A. Find the current it will draw when its temperature will further rise to 80°C. Also find the temperature coefficient of resistance of the coil at 20°C. [6]

b) Given the information provided in figure, calculate R_3, E, I and I_2. Equivalent resistance of the circuit is 4 Ω. [5]

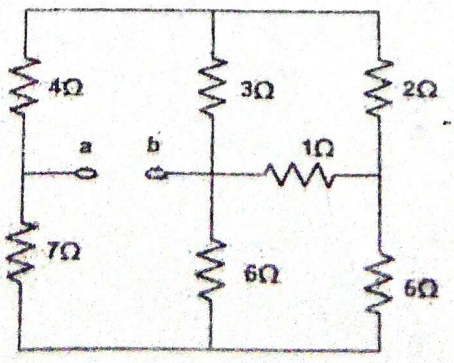


c) Apply superposition theorem to the circuit shown below to find the voltage drop V across the 5 Ω resistor. [5]



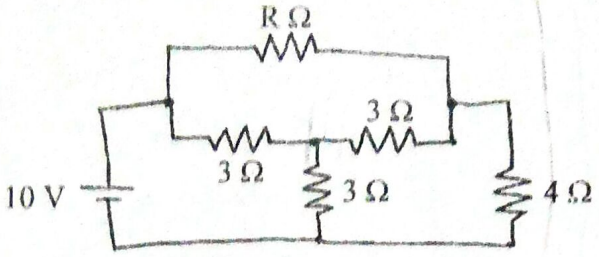
2. a) Why does the terminal voltage of a real voltage source decrease with increase in load current? Explain how a practical voltage source can be converted into a practical current source. [6]

b) Using star-delta transformation, find the equivalent resistance between terminals 'a' and 'b'. [6]

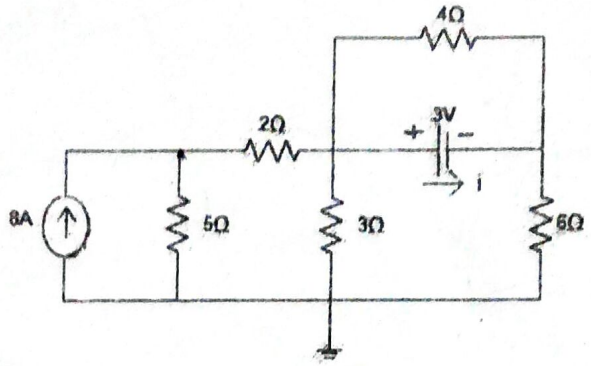


c) A capacitor with capacitance of 2 μF is connected in series with another capacitor whose capacitance is C_x. If the equivalent capacitance of the combination is 1.5 μF, calculate the value of C_x. What would be the equivalent capacitance if they were connected in parallel? [4]

3. a) Determine the value of R in the given network such that 4 Ω resistor consumes maximum power. [5]



b) Find the value of 'I' through the voltage source using Nodal analysis. [8]



4. a) An alternating current of frequency 50 Hz has a maximum value of 120 A. Write down the equation for its instantaneous value. Find also the instantaneous value after 1/360 sec and the time taken to reach 96 A for the first time. [6]

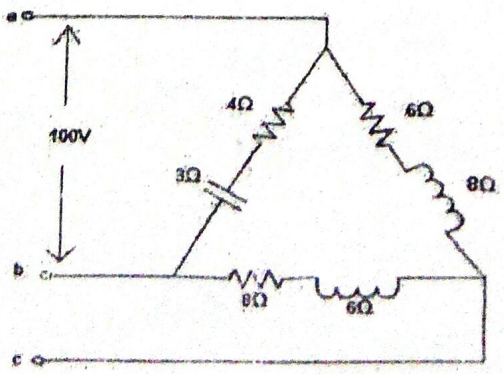
b) A coil is connected in series with a resistance of 30 Ω across 240 V, 50 Hz power supply. The reading of a voltmeter across coil is 180 V and across resistor is 130 V. Calculate resistance and reactance of coil. Also find power factor of whole circuit. [6]

c) Construct a phasor diagram of currents and voltages in a R-L-C series circuit. Assume $R = |0.8X_L| = |X_C|$. [4]

5. a) Explain disadvantages and causes of low power factor. [4]

b) A series combination resistor R and inductance L is driven by 25 V, 50 Hz supply. The power delivered to R and L are 100 W and 75 VAR. Determine the value of capacitance of a capacitor to be connected in parallel with source to improve its power factor to 0.9 (lagging). [5]

c) Discuss the advantages of three phase ac system over single phase ac system. For the given unbalanced delta connected load, find the phase currents, line currents and total power consumed by the load when phase sequence is abc. Construct the phasor diagram of currents and voltages in the load. [2+6+2]



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