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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B. Agri.	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

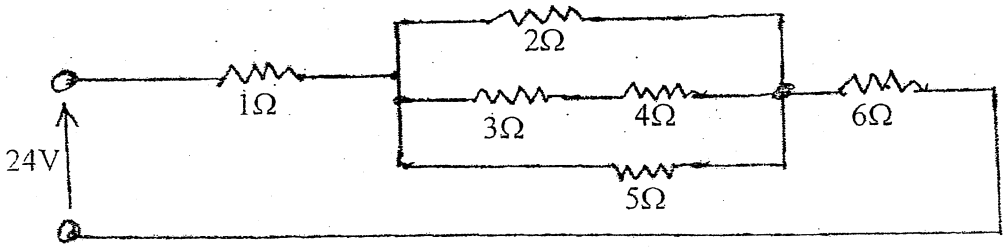
Subject: - Basic Electrical Engineering *(EE 401)*

- 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.*

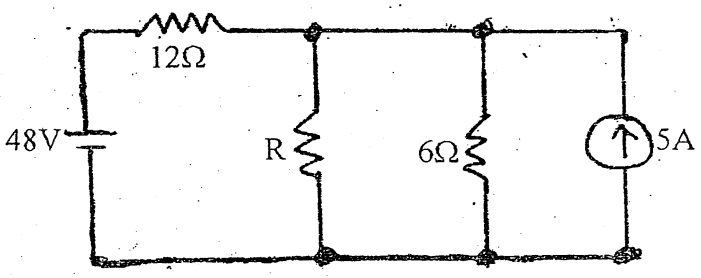
1. a) Explain emf, potential difference and current with a circuit diagram. [4]

   b) The temperature rise of the machine field winding was determined by the measurement of the winding resistance at 20°C the field winding resistance was 160 Ohm(Ω). After running the machine for some hours at full load the resistance is 185 Ω. If the temperature coefficient of resistance of the copper winding is 4.3×10^{-6}/°C at 0°C. Determine the temperature rise of the machine. [6]

   c) Find the equivalent resistance in the figure shown, and power dissipated in the 5Ω resistor. [6]



2. a) Calculate the value of R that will absorb maximum power from the circuit (shown in the figure). Also calculate the maximum power drawn by it. [6]



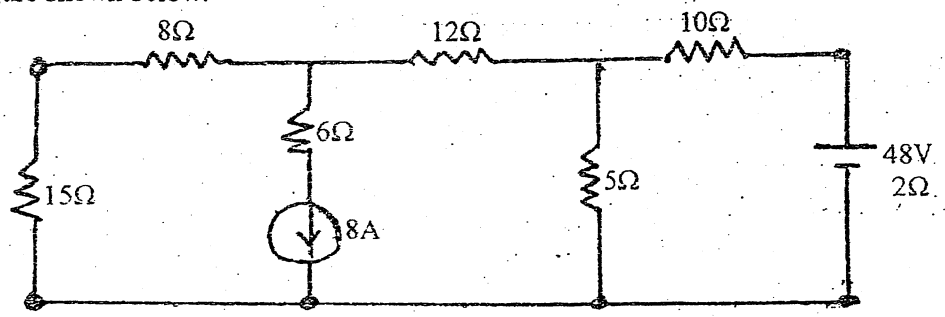
   b) State Norton's description theorem and list the steps for Nortonizing a circuit. Compare the Norton's equivalent circuit to the Thevenin's equivalent circuit. [6]

   c) What is the total cost of using the following at Rs 7 per killowatt hour? [4]

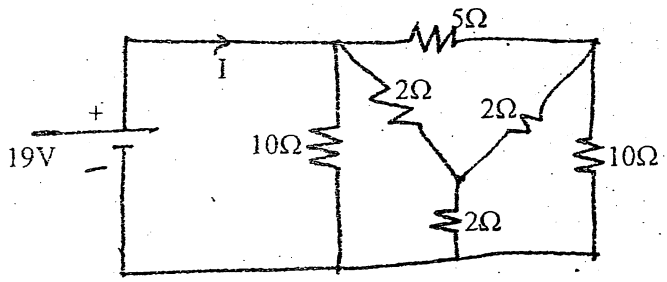
      i) A 1200 W toaster for 30 min
      ii) Six 50 W bulbs for 4 hours

iii) A 400 W washing machine for 45 min.
iv) A 4800 W electric cloths dryer for 20 min.

3. a) Use Nodal analysis method to calculate the current through the 15Ω resistor in the figure shown below. [8]

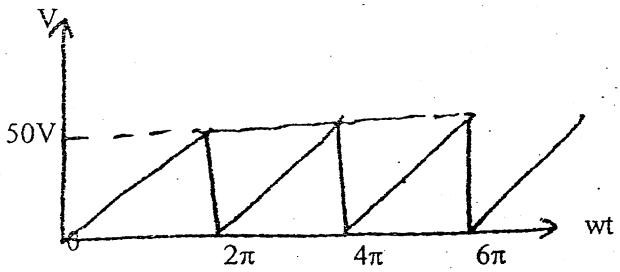


b) Find the current I as shown in figure below using star - delta transformation. [4]



c) An air cored coil is 2.5cm long and has an average cross-sectional area of $2cm^2$. Determine the number of turns if the coil has an inductance of 100 μH. [4]

4. a) Calculate the average value, rms value, form factor and peak factor of the saw tooth wave as shown in figure below. [6]



b) What do you mean by reactive power in AC circuit? Explain it by constructing phasor diagram for real power, reactive power and apparent power. [5]

c) Describe and illustrate the phasor relationship that exist between the voltage that appears across the terminals of a pure capacitor and the current that flows through it in steady state when the capacitor is excited by a sinusoidal source. [5]

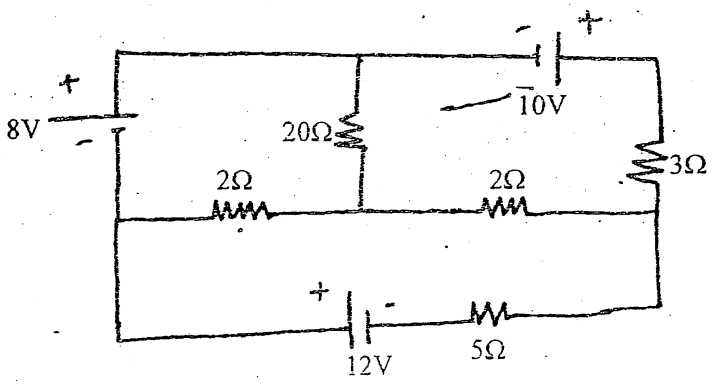
5. a) A voltage of $200\angle 0°$ V is applied across impedances in parallel. The value of impedances are $(12 + j16)\Omega$ and $(10-j20)\Omega$. Determine the KW, KVA and KVAR in each branch and the power factor of the whole circuit. [8]

b) A delta connected load of $Z_{AB} = 52\angle 45°\Omega$, $Z_{BC} = 52\angle -30°\Omega$ and $Z_{CA} = 10\angle 0°\Omega$ are connected to a 380V, 3 phase ac source. Find the magnitude of the line currents and total power absored by loads, when phase sequence is ABC. [8]

6. a) A single phase motor takes a current of 40A at pf 0.7 lagging from a 440V, 50HZ supply. What value must a shunting capacitor have to raise the power factor to 0.9 lagging. [8] [6]

b) What are the advantages of three phase AC system over signal phase ac system? [4]

c) Determine current in 5Ω resistor by mesh analysis in figure below. [6]



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