TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Bhadra

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

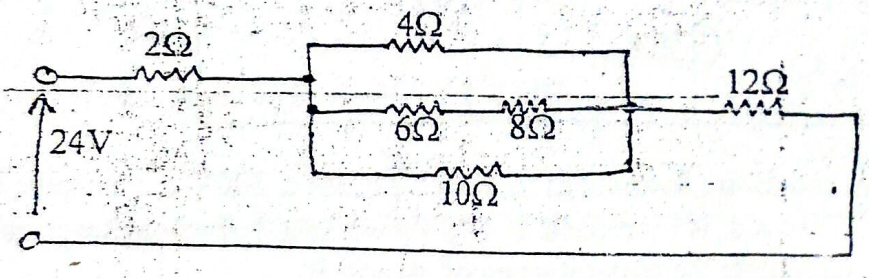
Subject: - Basic Electrical Engineering *(EE451)*

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

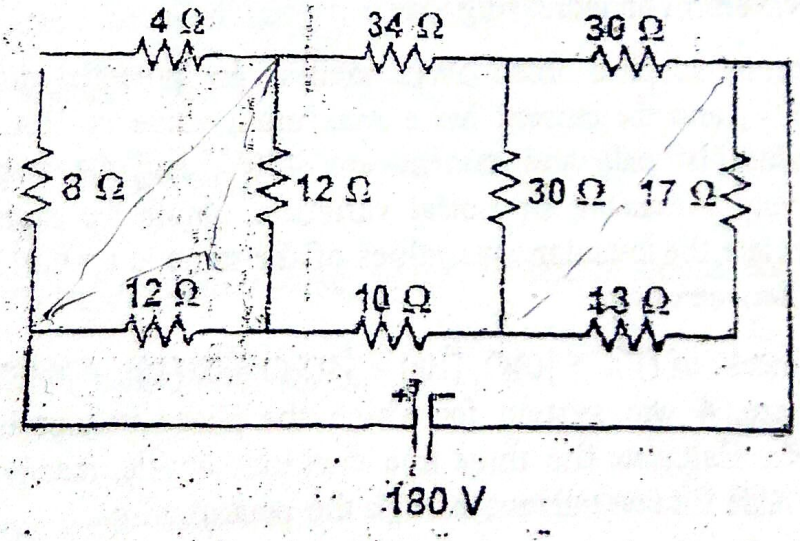
1. a) What do you mean by ideal and practical voltage source? Explain the effect of an internal resistance of a voltage source on its terminal characteristic. [4]

   b) A 230V metal filament lamp has its filament 50cm long with cross-sectional area of 3×10^{-6} cm^2. Specific resistance of the filament metal at 20°C is $4\times10^{-6}\Omega$cm. If the working temperature of the filament is 2000°C, find the wattage of the lamp. Temperature coefficient of resistance of the filament material at 20°C is 0.0055 per degree centrigrade. [6]

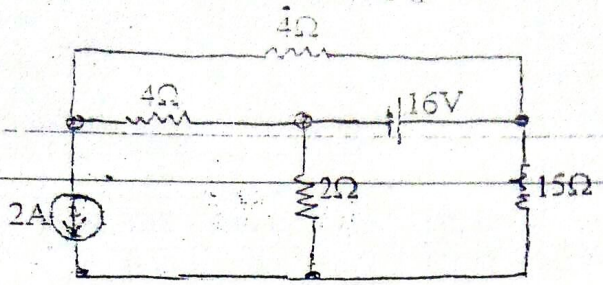
   c) Find the equivalent resistance in the figure below, and power dissipated in the 10Ω resistor. [6]



2. a) Determine the value of current in 10 Ohm resistor in the network shown in figure below using Star/Delta conversions. [6]

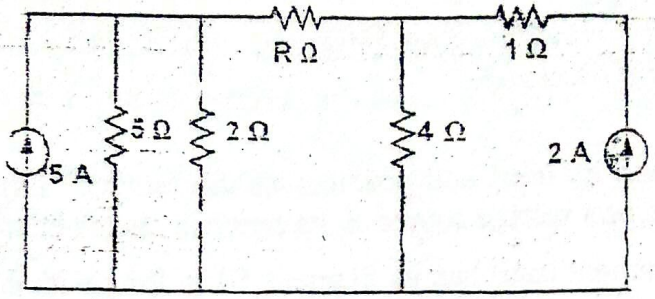


   b) Use Thevenin's theorem to find the current flowing through 15Ω resistor of the network of figure below. [6]

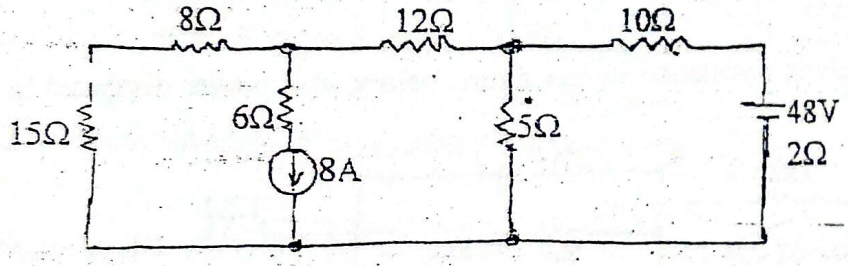


c) State Norton's theorem and list the steps for Nortonizing a circuit. [4]

3. a) Find the value of R such that maximum power transfer takes place from the current sources to the load R in figure below. Obtain the amount of power transfer. [8]



b) Use mesh current method to calculate the current through the 15Ω resistor in the figure shown below. [8]



4. a) Two capacitors, A and B are connected in series across a 200V d.c. supply. The p.d. across A is 120V. This p.d. is increased to 140V, when a 3μF capacitor is connected in parallel with B. Calculate the capacitances of A and B. [4]

b) Describe phasor representation and addition of two sinusoids $i_3 = i_1 + i_2$. Illustrate: [6]

i) Position of the phasors for t = 0
ii) Sinusoidal waveform for increasing time.

c) In a certain circuit, supplied from 50Hz mains, the potential difference has a maximum of 500V, and the current has a maximum value of 10A. At t = 0, the instantaneous values of p.d., and current are 400V, and 4A respectively, both increasing positively. Assuming sinusoidal variation, obtain the expression for p.d., and current. Calculate the instantaneous values of the same at t = 0.015s, and find the phase difference between them. [6]

5. a) Three impedances of (100 + j0)Ω, (100 – j40)Ω and (100 + j60)Ω are connected in star to a 3-phase, 4 wire system for which the phase voltage is 100V and its frequency is 60Hz. Calculate the three line currents, active, reactive and apparent power per phase. Also find the current through the neutral wire. [8]

b) A voltage of 200∠53.8 is applied across two impedances in parallel. The values of impedances are (12 + j16) Ohm and (10 – j20) Ohm. Determine: (i) Total impedance (ii) total current drawn from the circuit (iii) Current flowing through each parallel branch (iv) Power factor of the whole circuit (v) Active, reactive and apparent power. Draw the phasor diagram. [8]

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