

Level: Bachelor  
Semester: Fall  
Programme: BE  
Course: Basic Electrical Engineering

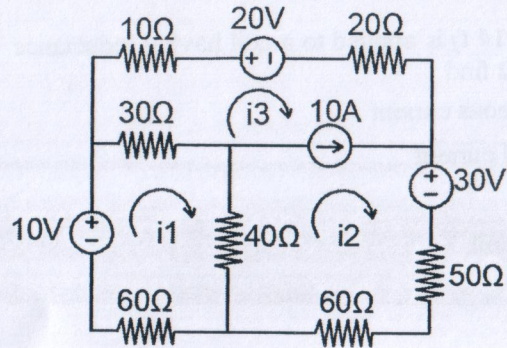
Year : 2020  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

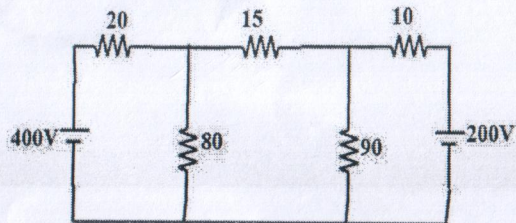
The figures in the margin indicate full marks.

Attempt all the questions.

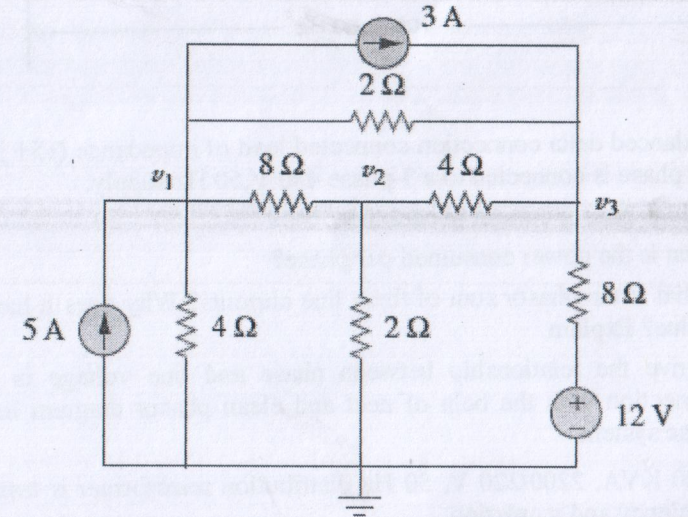
1. a) Describe in brief the generation, transmission, distribution, and consumption of electrical energy with the help of single line diagram. 7
- b) Find  $i_1$ ,  $i_2$ ,  $i_3$  current using mesh analysis method. 8



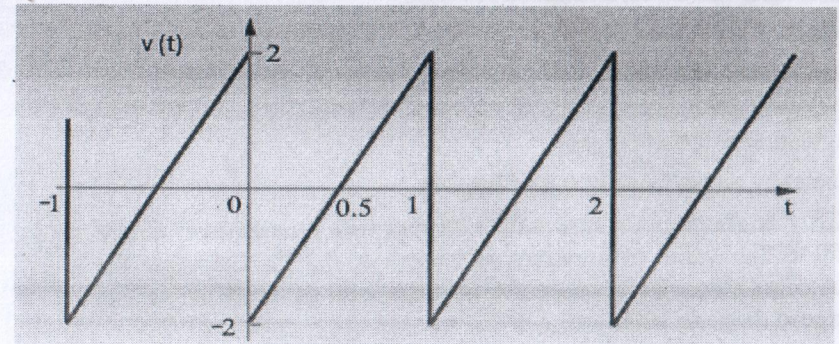
2. a) Find the power dissipation in the 15Ω resistor. Use superposition theorem to find the current flowing through it. All resistances are in ohms. 8



- b) Find  $v_1$ ,  $v_2$  and  $v_3$  in the following circuit using nodal analysis. 7

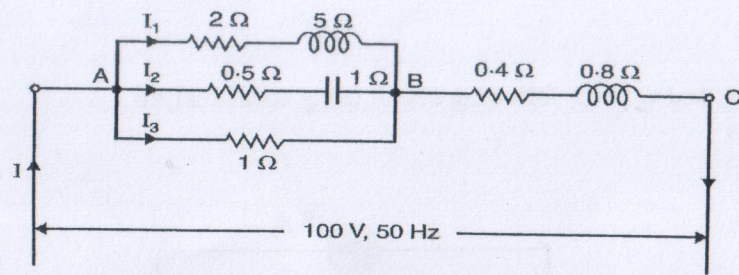


3. a) Find the rms and average values of the sawtooth waveform shown below 7



- b) For the circuit shown determine (i) circuit impedance (ii) power consumed by each branch. 8



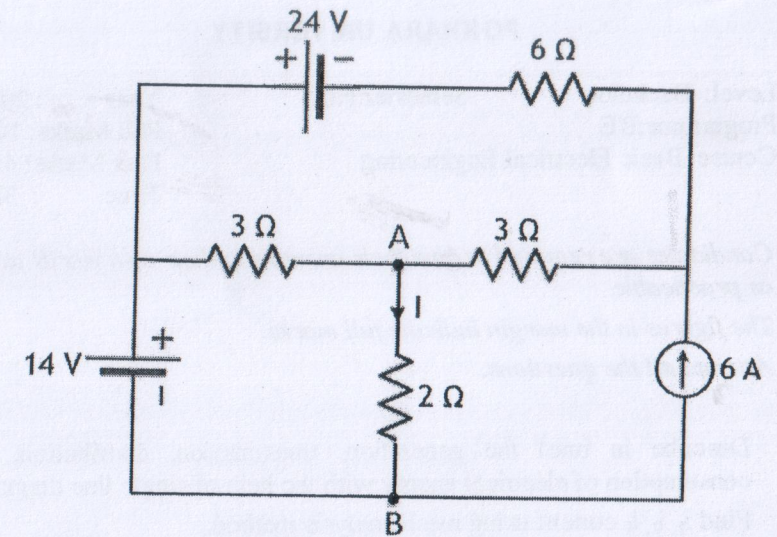


4. a) A balanced delta connection connected load of impedance  $(15 + j 20) \Omega$  per phase is connected to a 3-phase 440 V, 50 Hz supply. 8
  - i) Find the phasor current in each line.
  - ii) What is the power consumed per phase?
  - iii) What is the phasor sum of three line currents? Why does it have this value? Explain
- b) Derive the relationship between phase and line voltage in a star connection with the help of neat and clean phasor diagram in three phase system. 7
5. a) A 20 KVA, 2200/220 V, 50 Hz distribution transformer is tested for efficiency and regulation. 8

OC test: 220 V, 4.2 A, 148 W on LV side  
SC test: 86 V, 10.5 A, 360 W on HV side.

Determine:

  - i) Equivalent resistance and reactance referred to Primary and Secondary side.
  - ii) Regulation at 0.8 pf lagging.
  - iii) Efficiency on half load at 0.8 pf lagging.
- b) A 220v dc shunt motor runs with 1200rpm with an armature current of 50A. The value of armature resistance is  $0.2 \Omega$ . Calculate the value of resistance to be connected in series with the armature so that the speed drops to 1000rpm 7
6. a) Use superposition theorem to find the current through and voltage drop across the 2 ohms resistor. 8



- b) A voltage  $v = 141.4 \sin(314 t)$  is applied to a coil having inductance of  $0.1 \text{ H}$  and resistance  $10 \Omega$  find 7
  - i. expression for instantaneous current
  - ii. rms value of voltage and current
  - iii. power factor
  - iv. power consumed in the coil.
7. Write short notes on: (Any two) 2×5
  - a) Norton's Theorem
  - b) Resistor colour coding
  - c) Phase sequence and its significance