

Time: 03 hours

Max. Marks: 80

Note

- i. Question number 1 is compulsory.
- ii. Solve any three of the remaining questions.
- iii. Assume suitable data wherever necessary.
- iv. Figures to the right indicate full marks.

Q1 Attempt **any Four** of the following.

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- a) Find the average value of waveform shown in figure-1 below



Figure-1

- b) Derive the relation between line voltage and phase voltage, line current and phase current for three phase balanced delta connected load.
- c) Determine the currents I_1 , I_2 , and I_3 using mesh analysis for circuit shown in figure-2 below.

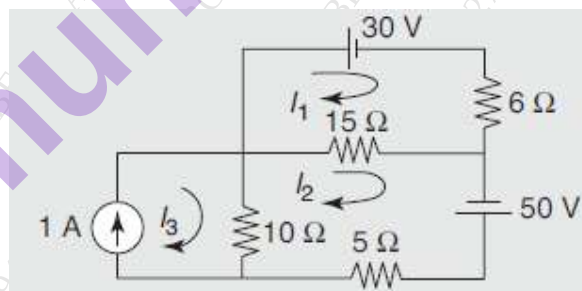


Figure-2

- d) Explain working principle of transformer with neat diagram
- e) What is the function of the commutator in a DC generator and DC motor?

Q2 Attempt all of the following

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- a) Determine current through $5\ \Omega$ resistor for circuit shown in figure-3 below using Superposition theorem

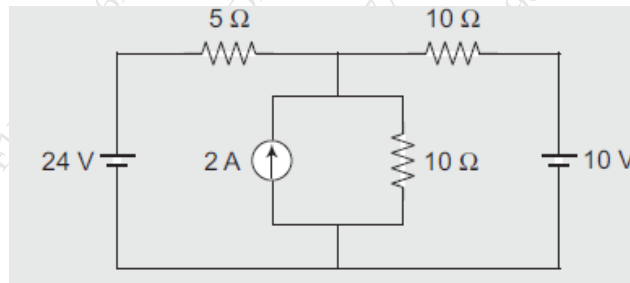


Figure-3

- b) A coil connected to 100V DC supply draws a current of 10A while the same coil when connected to 100V 50 Hz AC supply draws a current of 5A. Calculate parameters of the coil and power factor. Also calculate power consumed by the coil.

Q3 Attempt all of the following.

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- a) Determine the value of load resistance for maximum power transfer for the circuit shown in figure-4 below. Also find the value of maximum power.

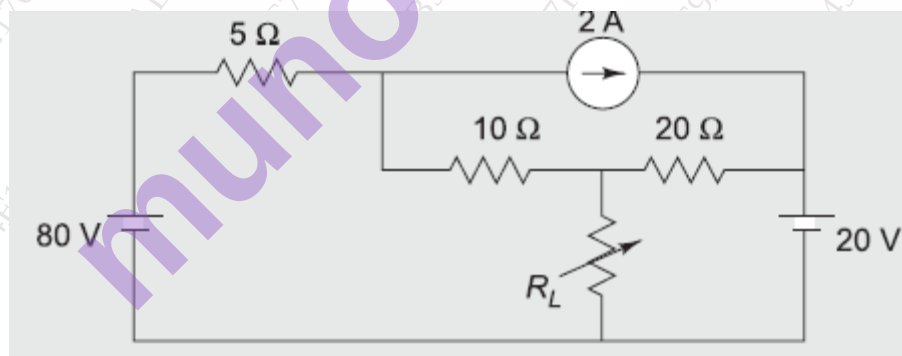


Figure-4

- b) Develop step by step the equivalent circuit of the transformer referred to any one side.

Q4 Attempt all of the following.

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- a) Two impedances $20 \angle -45^\circ\ \Omega$ and $30 \angle 30^\circ\ \Omega$ are connected in series across certain AC supply and resulting current is 10A. If the supply voltage remains the same, calculate supply current when two impedances are connected in parallel.
- b) Three identical impedances each with resistance of $10\ \Omega$ and reactance of $20\ \Omega$ are connected in star across three phase 440V AC supply. Determine phase and line currents active, reactive and apparent power and readings of two Wattmeters connected to measure the power.

Q5 Attempt all of the following.

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- a) A 1000/200V, 50 Hz, single phase transformer gave the following test results:
- | | | | |
|--------------------|-------|-------|------|
| OC test (HV Side): | 1000V | 0.24A | 90W |
| SC test (HV Side): | 50V | 5A | 110W |
- Determine:
- Equivalent circuit parameters referred to HV side
 - Efficiency on half load and 0.8 pf lagging
 - Regulation on full load and 0.8 pf leading
- b) Describe types of power in three phase circuits. Explain two wattmeter method of power measurement in three phase circuit with circuit diagram and phasor diagram for three phase balanced star connected load with lagging pf

Q6 Attempt all of the following.

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- a) Classify DC motors. Draw schematic diagrams of each. Explain the significance of back emf.
- b) Compare series and parallel resonance. A series resonant circuit has $R=10\ \Omega$, $L=0.01\text{H}$ and $C=100\mu\text{F}$. Determine the resonant frequency, quality factor and bandwidth.
