Total No. of Questions : 10]

SEAT No. :

PF12631

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ESC-102-ELE : BASIC ELECTRICAL ENGINEERING

(2024 Credit Pattern) (Semester - I/II)

Time : 2½ Hours] *[Max. Marks : 60*

Instructions to the candidates:

1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data, if necessary.*
5) *Use of non-programmable calculator is allowed.*

Q1) a) Define the following terms with reference to D.C. resistive network. **[6]**

i) Unilateral and bilateral network

ii) Linear and non-linear network

iii) Lumped and distributed network

b) Find current flowing through 8Ω resistance by using Kirchhoff's loop current method. **[6]**

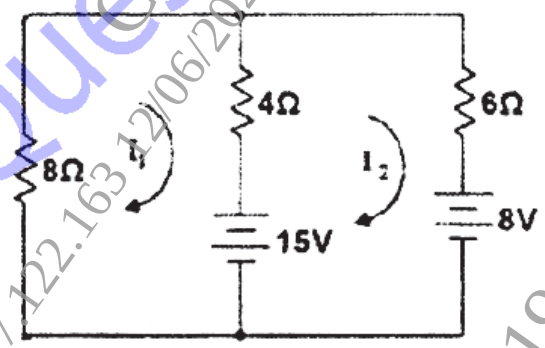


Figure. 1

OR

Q2) a) Derive the expressions to convert Delta connected resistive network into its equivalent Star connected resistive network. **[6]**

b) Find the current through 8Ω resistance using Superposition Theorem for the circuit shown in Figure 1. **[6]**

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Q3) a) What is magnetic circuit? For simple magnetic circuit, derive the relation between magnetic flux, MMF and reluctance. **[6]**

b) An iron ring of relative permeability of 900 has mean circumference of 40 cm and cross-sectional area of 5cm^2. A coil of 400 turns and carrying current of 2A is wound on this ring. **[6]**

Calculate :

i) MMF

ii) Magnetic Field strength

iii) Reluctance

iv) Magnetic Flux density

OR

Q4) a) Compare Magnetic circuit and Electric circuit, by clearly stating their similarities and dissimilarities. **[6]**

b) Define mutual-inductance and derive an expression for mutually induced EMF with the help of suitable diagram. **[6]**

Q5) a) Define the following terms with respect to sinusoidal alternating quantity. **[6]**

i) Instantaneous value

ii) Amplitude

iii) Frequency

iv) Time period

v) Form factor

vi) Peak factor

b) The RMS value of 50 Hz sinusoidal alternating current is 20A. At t = 0, its value is 10A. **[6]**

i) Write the equation for the current

ii) Find the instantaneous value of current at t = 6 milli-seconds.

OR

Q6) a) Derive an expression for current drawn by a circuit consisting of pure 'C' connected across sinusoidal single phase alternating voltage. Draw waveforms for voltage and current. Also draw phasor diagram. **[6]**

b) A 100 mH inductance is connected across 230 V, 50Hz single phase supply. Find **[6]**

i) Inductive reactance

ii) RMS value of current

iii) Maximum value of current

iv) Expression for current

v) Draw Phasor diagram

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Q7) a) Derive the expression for instantaneous and average power for R-C series circuit when connected across an alternating voltage of $v = Vm\ Sin\ (\omega t)$. **[6]**

b) A resistance of 20Ω, inductance of 50 mH and capacitance of 75 μF are connected in series across 230 V, 50 Hz single phase supply. Find **[6]**

i) Inductive and capacitive reactance

ii) Impedance and current

iii) Power factor and its nature

OR

Q8) a) Derive the relation between line and phase values of currents and voltages for a balanced three phase, star connected R-L load. **[6]**

b) A 440 V, three phase voltage is applied to a balanced delta-connected load with impedance of 25 ∠53.13°Ω per phase. Find **[6]**

i) Phase Voltage

ii) Phase Current

iii) Line Current

iv) Active Power

v) Reactive Power

vi) Apparent Power

Q9) a) Explain the working principle of DC motor with suitable diagrams. Also state two applications of DC shunt and Series motor. **[6]**

b) A 100 KVA single phase transformer has full load copper loss of 1200 W and iron loss of 960 W. Calculate : **[6]**

i) The efficiency at full load with unity power factor

ii) The efficiency at 75% full load with 0.707 power factor

OR

Q10) a) Why the single-phase induction motor is not self-starting? What arrangement is used to make it self starting motor? State two applications of resistive split phase and capacitor start single phase induction motor. **[6]**

b) Define kVA rating of transformer. How primary and secondary current can be calculated from kVA rating. **[6]**



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