Total No. of Questions: 10] **SEAT**

PE-12176 **[Total No. of Pages: 3**

[6581]-2407-CR

F.E.

ESC-102-ELE: BASIC ELECTRICAL ENGINEERING

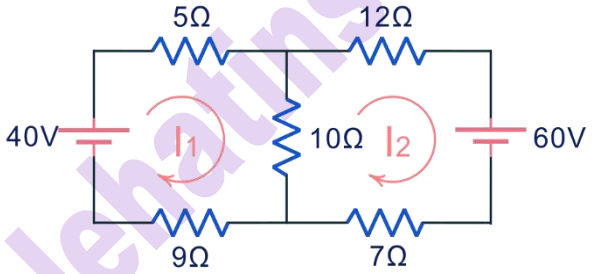
(2024 Pattern) (Credit System) (Semester – I/II)

Time: 2.5 Hour] ***[Max. Marks: 70***

Instructions to the candidate:

1) ***Attempt any one from Q1 or 02, 03 or 04, Q5 or 06, 07 or 08, Q9 or Q10.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use non-programmable calculator is allowed.***

Q1) a) Find the current flowing through 10 ohm resistance using Kirchhoff's loop current method. **[6]**

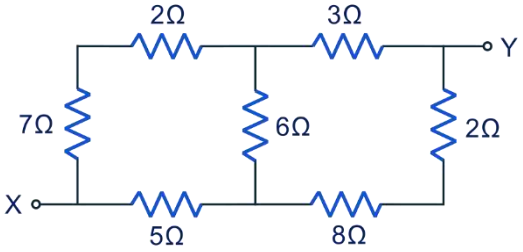


b) Explain with suitable diagram **[8]**

i) Linear network
ii) Nonlinear network
iii) Lumped network
iv) Distributed network.

OR

Q2) a) Find the equivalent resistance between terminals X and Y. All resistances are in ohm. **[6]**



b) State and explain Superposition theorem with the help of suitable example. **[8]**

Q3) a) A coil of 1480 turns is wound uniformly on an iron ring of mean circumference 500 cm and cross-sectional area of 8 cm2 A current of 3A is passed through the coil. The iron ring has the relative permeability of 1200, Calculate **[6]**

i) Magneto motive force
ii) Magnetic field strength
iii) Magnetic flux density
iv) Reluctance of the iron ring

b) Define self-inductance and derive the expression for Energy stored in magnetic field. **[8]**

OR

Q4) a) Obtain an expression for coefficient of coupling between two magnetically coupled coils. **[6]**

b) Derive the expression for mutually induced EMF in terms of mutual inductance. Also state any three factors affecting value of mutual inductance. **[8]**

Q5) a) If $V1 = 12 + j15$ and $V2 = 8 - j6$ then find the results of following mathematical operations in **[6]**

i) $V1 + V2$
ii) $V1 - V2$
iii) $V1 \times V2$
iv) $V1/V2$

b) Define the RMS value and derive an expression for RMS value in terms of maximum value for sinusoidally varying current. **[8]**

OR

Q6) a) A pure inductor having inductance of 200mH 230 V, 50 Hz single phase AC supply. Determine **[6]**

i) Inductive reactance
ii) RMS and maximum value of current
iii) Equation for instantaneous value of current

b) Derive the expression for instantaneous and average power in case of purely resistive circuit. Also draw the waveforms for voltage, current and instantaneous power. **[6]**

Q7) a) Resistance of 20 ohm and Capacitance of 50uF are connected in series across 230 V, 50 Hz single phase AC supply. Calculate **[6]**

i) Capacitive reactance
ii) Impedance
iii) Current
iv) Active power

b) Draw phasor diagram for following cases for R-L-C series circuit [8] **[6]**

i) XL > XC
ii) XL < XC
iii) XL = XC

OR

Q8) a) A three-phase delta-connected load, with impedance of $(25 + j40)$ is fed from a three-phase 440 V, 50 Hz supply, Calculate: **[6]**

i) Phase current
ii) Line current
iii) Power factor
iv) Total active power

b) Define the following terms with three phase AC circuit **[8]**

i) Phase Sequence
ii) Symmetrical system
iii) Balanced load
iv) Unbalanced load

Q9) a) A 10 kVA 220/440V, 50Hz. single phase transformed, primary and secondary resistance of 0.4292 and 0.849 respectively. The eddy current loss in core is 310W and hysteresis loss in the core is equal to 380W. Calculate **[6]**

i) Total iron losses
ii) Total copper losses on full load
iii) Efficiency at 80% of the full load at 0.8 p.f leading

b) List the different types of electrical Motors. Explain working principle of three phase induction motor. **[8]**

OR

Q10) a) Derive the EMF equation of single-phase transformer. **[6]**

b) Draw the sectional view of DC motor. Explain in detail the functions of any four parts of the DC motor. **[8]**