

[6581]-2407

F.E.

ESC-102-ELE: BASIC ELECTRICAL ENGINEERING

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

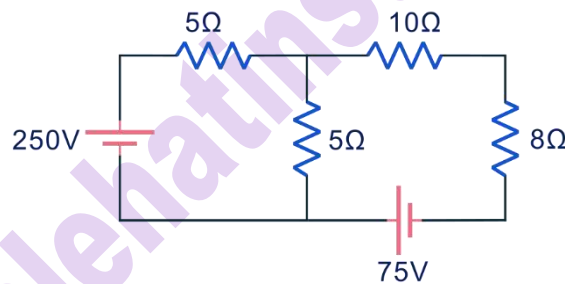
Time: 2.5 Hour]

[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.

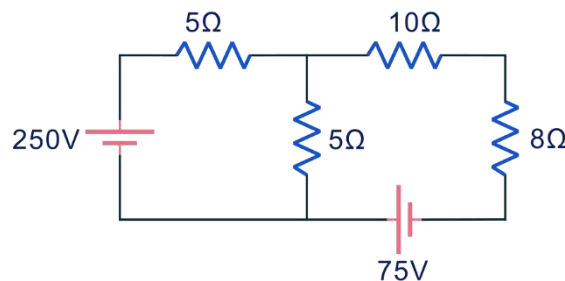
- Q1)** a) Find current through 8 Ohm resistance using KVL. **[6]**



- b) Explain typical power system with neat block diagram. Mention voltage levels of every section. **[6]**

OR

- Q2)** a) Find current through 8 Ohm resistance using Super position theorem. **[6]**



- b) Derive the formulae for conversion of delta to equivalent star connected network. Draw neat circuit diagram. **[8]**

- Q3)** a) A steel ring of 175 cm mean diameter has a cross-sectional area of 250 mm². Flux developed in the ring is 500 uwb when 3500 turns coil carries certain current. Assuming μ_r of steel to be 1250. [6]

Find i) mmf required ii) reluctance iii) current

- b) Define magnetic circuit. State any 04 similarities and any 02 dissimilarities with electrical circuit. [8]

OR

- Q4)** a) a) Define reluctance. Write formula and its unit. State the formula for reluctance magnetic circuit i) having only iron path ii) having iron path & one air gap. [6]

- b) With usual notation derive the formula for self-induced emf. Enlist the factors affecting self-inductance.

- Q5)** a) If $A = 25 + j 35, B = 30 - j 40$ and $C = j 15$ [6]

Find i) $A + B - C$ ii) $AB - C$ iii) $A + BC$

- b) Define average value of an alternating quantity. Obtain an expression for average value in terms of maximum value. [6]

OR

- Q6)** a) An AC voltage of $v = 250 \sin (314.16t)$ applied to a pure capacitance of 125 μF . [6]

- i) Write equation for current
ii) Draw phasor diagram
iii) Average power consumed.

- b) When voltage $v = V_m \sin (\omega t)$ is applied to purely inductive circuit.[8] [6]

- i) Derive current equation
ii) State instantaneous power equations
iii) Draw the phasor diagram.

- Q7)** a) A coil having resistance of 7 and an inductance of 31.8 mH is connected to single phase 230V 50 Hz AC supply. Calculate [6]

- i) Impedance
ii) Current through circuit
iii) Power factor
iv) Power consumed
v) Voltage drop resistance and inductor

- b) What is series resonance? Derive the expression for resonance frequency. Draw phasor diagram for resonance condition. [6]

OR

Q8) a) Each phase of star connected load has an impedance $25 + j40$ connected across 3 phase 415 V 50 Hz supply. Find i) Phase and line current ii) All powers [6]

b) Derive formula for relation between phase voltage and line voltage in delta connected resistive load. State formulae for all powers in terms of only line parameters. [6]

Q9) a) 80 KVA 1000/250 V 50 Hz, 800 watt and full load copper loss of 1200 watt. Estimate [6]

i) Efficiency at full load 0.8 power factor

ii) Efficiency at half load unity power factor

b) Compare between core and shell type of single-phase transformers [8] [6]

OR

Q10) a) Explain the working principle of 3 phase squirrel cage induction motor. State any two applications. [6]

b) Explain the construction and working principle of DC shunt motor with suitable diagram. State any two applications of it. [6]

