Total No. of Questions : 10]

SEAT No. :

PE-12176

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F.E.

ESC-102-ELE : Basic Electrical Engineering

(2024 Pattern) (Semester - I/II)

Time : 2½ Hours] *[Max. Marks : 60*

Instructions to the candidates :

1) *Attempt any one from Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, 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 of non-programmable calculator is allowed.*

Q1) a) Explain generation, transmission and distribution of electricity with the help of neat labled single line diagram. **[6]**

b) Find out current in the 1 Ω resistance in Fig. 1 by using Kirchhoff's loop current analysis. **[6]**

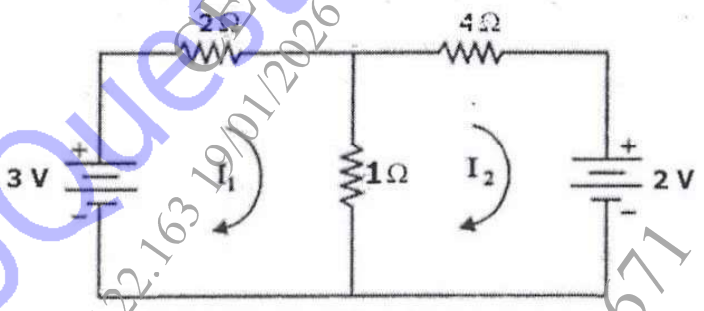


Fig. 1

OR

Q2) a) Derive the equations to convert delta connected resistive network into equivalent star connected network. **[6]**

b) Find out current in the 1 Ω resistance in Fig. 1 by using superposition theorem. **[6]**

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Q3) a) Compare electric circuit with magnetic circuit by mentioning their similarities & dissimilarities. **[6]**

b) Two coils have 200 and 100 turns respectively wound on magnetic circuit with cross sectional area of 5 cm^2. They have current of 2A and 0.5A flowing in it respectively and producing 1 mili-weber flux in each coil. The coefficient of coupling between them is 0.8. Calculate the self-inductance of each coil and mutual inductance between them. **[6]**

OR

Q4) a) Define self-inductance in two ways. Also state the factors on which self- inductance depends. **[6]**

b) Derive the expression for coefficient of coupling between two coils. **[6]**

Q5) a) Define average value and derive an expression for average value of sinusoidal current in terms of its peak value. **[6]**

b) An alternating current of pure sine wave has peak value 14. 14A and frequency of 50Hz. Find the instantaneous value of current at 4 milli-seconds and 8 milli-seconds. Also show these values on current waveform. **[6]**

OR

Q6) a) Derive the mathematical expression for the current flowing through a pure capacitor when connected to an AC supply. Support your answer with : **[6]**

i) A neatly labelled circuit diagram

ii) A phasor diagram

iii) Waveforms of voltage and current

b) Single phase, 230V, 50Hz AC supply is connected to 30 milli-henry pure inductor. Draw circuit diagram and phasor diagram. Calculate. **[6]**

i) Inductive reactance

ii) Current

iii) Power factor

iv) Power consumed

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Q7) a) Draw impedance triangles for RL and RC series circuit. Also, express impedance in rectangular and polar form in both cases. **[6]**

b) Single phase, 230V, 50Hz AC supply is connected to series circuit with resistance of 30 ohm and capacitive reactance of 40 ohm. Calculate **[6]**

i) Impedance
ii) Current
iii) Power factor angle
iv) Power factor
v) Power consumed. Also draw phasor diagram

OR

Q8) a) With the help of suitable circuit diagram and phasor diagram, derive relationship between line current and phase current in delta connected balanced R-L load supplied by symmetrical three phase AC supply. **[6]**

b) Three phase, 400V, 50Hz AC supply is connected to star connected three phase load having series circuit consisting of resistance of 8 ohm and inductive reactance of 6 ohm in each phase. Calculate **[6]**

i) Impedance per phase,
ii) Phase voltage
iii) Phase current
iv) Power factor
v) Active power
vi) Reactive Power

Q9) a) State different types of losses taking place in transformer along with mathematical equations. In which part do these losses take place. How these losses can be minimized. **[6]**

b) A 5 kVA, 3000V/200V, 50 Hz single phase transformer has cross sectional area of 150 cm^2 for the core. If the number of turns of low voltage winding are 80, then calculate **[6]**

i) Number of turns of high voltage winding
ii) Maximum value of flux density in core
iii) Secondary full load current

OR

Q10) a) Describe working principle of three phase induction motor by using rotating magnetic field theory. State two applications of squirrel cage induction motor and slip ring induction motor. **[6]**

b) Explain working of split phase type of single-phase induction motor with the help of circuit diagram. State the function of centrifugal switch and auxiliary winding in it. Also write any two applications of this motor. **[6]**



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