

Total No. of Questions : 8]

SEAT No. :

P3663

[Total No. of Pages : 4

[6001]-4905

F.E. (All Branches)

BASIC ELECTRICAL ENGINEERING
(2019 Credit Pattern) (Semester - I/II) (103004)

Time : 2½ Hours]

[Max. Marks : 70

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 additional data, if necessary.*
- 5) *Use of non-programable calculator is allowed.*

Q1) a) Define impedance. Draw the impedance triangle for R-L & R-C series circuit. **[4]**

b) Obtain the expression for current and power, when voltage $v = V_m \sin \omega t$ is applied across purely inductive circuit. **[6]**

c) The series circuit having resistance 10Ω , inductance 0.1 H and capacitance $150 \mu\text{F}$ is connected to 1-phase, 200 V , 50 Hz AC supply, Calculate - **[8]**

i) Inductive reactance X_L

ii) Capacitive reactance X_C

iii) Net reactance X

iv) Impedance Z

v) Current drawn by the circuit

vi) Power factor

vii) Active power P

viii) Reactive power Q .

OR

Q2) a) If 200 V , 50 Hz supply is applied across the resistance of 10Ω , find equation for voltage & current. **[4]**

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- b) Derive the expression for power, when voltage $v = V_m \sin \omega t$ is applied across R-L series circuit. [6]
- c) The series circuit having resistance 10Ω and capacitance $150 \mu\text{F}$ draws a current of 9.4 A from 1-phase, 50 Hz AC supply. Calculate -
- Capacitive reactance
 - impedance
 - power factor
 - supply voltage
 - Active power and
 - reactive power. [8]

- Q3)** a) Define
- Balanced load
 - Unbalanced load and
 - Phase sequence. [3]
- b) Derive the EMF equation of single phase transformer. [6]
- c) Derive the relation between i) phase voltage and line voltage ii) phase current and line current in case of balanced STAR connected 3-ph inductive load. Assume phase sequence RYB. Draw the circuit diagram & necessary phasor diagram. [8]

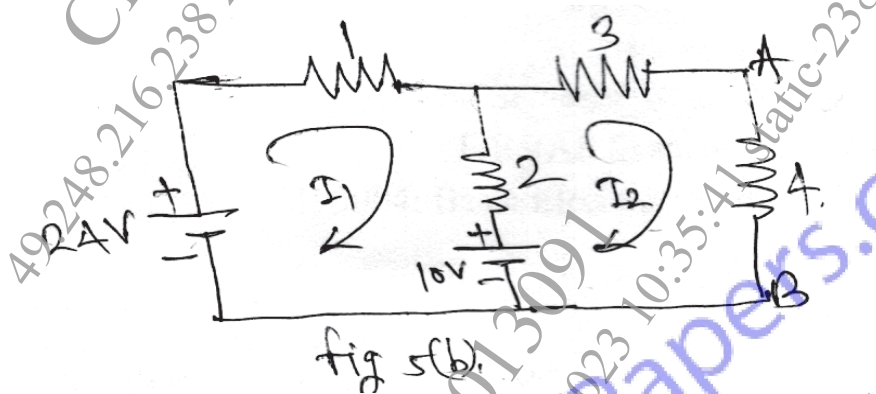
OR

- Q4)** a) Define the voltage regulation and efficiency of transformer along with formula. [3]
- b) The maximum flux density in core of a $250/1000 \text{ V}$, 50 Hz , 1-ph transformer is 1.2 T . If EMF/turn is 10 V , calculate i) Primary & secondary number of turns ii) area of cross section of core. [6]

- c) Three identical impedances each of $6+j8 \Omega$ are connected in star across 3-ph, 400 V, 50 Hz ac supply. Determine. [8]
- phase voltage
 - phase current and line current
 - power factor, 3-ph active, reactive and apparent power

Q5) a) State and explain KCL & KVL [4]

- b) Calculate the current flowing through 4Ω (AB) for the circuit shown in fig 5b, using Kirchhoff's Laws. All resistances are in Ω [6]

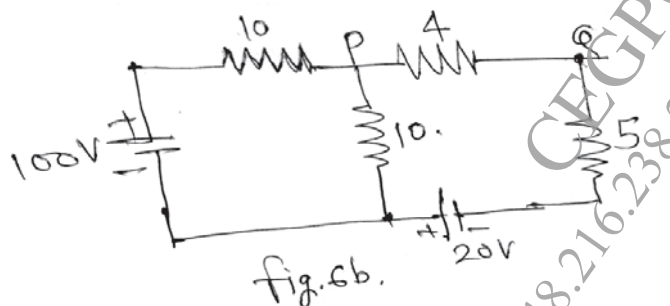


- c) Derive the equations to convert Delta connected resistive circuit into equivalent Star circuit. [8]

OR

Q6) a) Explain the practical current source by means of [4]

- Symbol of representation
 - Value of internal resistance
 - Graphs between V and I
- b) Calculate the current flowing through 4Ω (PQ) for the circuit shown in fig 6b, using Superposition Theorem. All resistances are in Ω [6]



- c) Calculate the current flowing through 4Ω (PQ) for the circuit shown in fig 6b, using Thevenin's Theorem. [8]

- Q7)** a) Define resistance of the material & state factors on which it depends. [3]
b) Explain construction and working principle of Lithium ion battery. [6]
c) Derive an expression for insulation resistance of a single core cable with the necessary diagram. [8]

OR

- Q8)** a) State the material used for positive plate, negative plate & electrolyte for lead acid battery. [3]
b) The current flowing at the instant of switching 240 V, 40 Watt lamp is 2 A. The TCR of tungsten filament is 0.0055 per degree Celsius at 20°C. Determine.
i) temperature of filament of the lamp ii) working current [6]

- c) If α_1 and α_2 are the RTC of a conducting material at $t_1^\circ\text{C}$ and $t_2^\circ\text{C}$ respectively prove that $\alpha_2 = \frac{\alpha_1}{1 + \alpha_1(t_2 - t_1)}$ & hence, obtain $\alpha_t = \alpha_0 / (1 + \alpha_0.t)$ [8]

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