Total No. of Questions : 8]

SEAT No. :

P3663

[Total No. of Pages : 4

[6001]-4005

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 ωt is applied across purely inductive circuit. **[6]**

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

i) Inductive reactance Xl

ii) Capacitive reactance Xc

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 10 Ω, 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 10 Ω and capacitance 150 μF draws a current of 9.4 A from 1-phase, 50 Hz AC supply. Calculate -

i) Capacitive reactance

ii) impedance

iii) power factor

iv) supply voltage

v) Active power and

vi) reactive power. **[8]**

Q3) a) Define

i) Balanced load

ii) Unbalanced load and

iii) 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 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 Ω are connected in star across 3-ph, 400 V, 50 Hz ac supply. Determine. **[8]**

i) phase voltage

ii) phase current and line current

iii) power factor, 3-ph active, reactive and apparent power

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

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

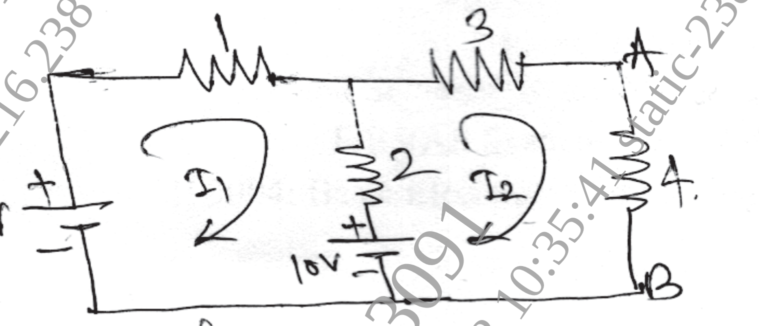

fig 5(b).

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]**

i) Symbol of representation

ii) Value of internal resistance

iii) Graphs between V and I

b) Calculate the current flowing through 4 Ω (PQ) for the circuit shown in fig 6b, using Superposition Theorem. All resistances are in Ω **[6]**

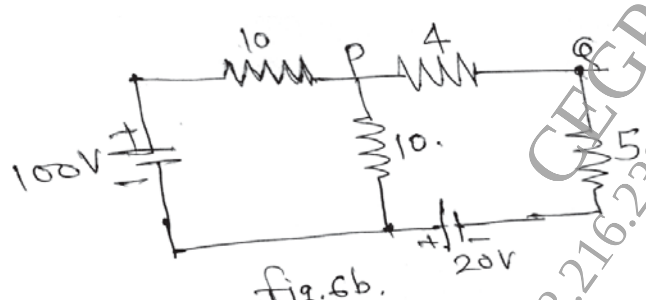

fig.6b.

c) Calculate the current flowing through 4 Ω (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 20ºC. Determine. **[6]**

i) temperature of filament of the lamp ii) working current

c) If α_1 and α_2 are the RTC of a conducting material at t_1^0C and t_2^0C respectively prove that $\alpha_2 = \dfrac{\alpha_1}{1+\alpha_1(t_2 - t_1)}$ & hence, obtain $\alpha_t = \alpha_0 / (1 + \alpha_0 . t)$ **[8]**