Total No. of Questions : 8]

SEAT No. :

P6489

[Total No. of Pages : 4

[5868]-105
F.E. (All Branches)
103004 : BASIC ELECTRICAL ENGINEERING
(2019 Pattern) (Semester - I/II)

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-programmable calculator is allowed.***

Q1) a) Define and state the unit of admittance, conductance & susceptance. Also draw the admittance triangle for inductive circuit. **[4]**

b) Obtain the expression for current and power, when voltage $v = V_m \sin \omega t$ is applied across purely resistive circuit. Also draw the waveform for voltage, current & power on common X-axis. **[6]**

c) The series circuit having resistance 5 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) Define and state the unit of active, reactive and apparent power in case of single phase circuit. Draw the power triangle. **[4]**

b) Derive the expression for resonant frequency and comment on impedance, current and power factor in case of series resonance circuit. **[6]**

c) Derive the expression for power, when voltage $v = V_m \sin \omega t$ is applied across R-L series circuit. Also draw the waveform for voltage, current & power on common X-axis. **[8]**

P.T.O.

Q3) a) What is phase sequence? State it's any two applications. **[3]**

b) State the relation between : **[6]**

i) Phase voltage and line voltage

ii) Phase current and line current in case of balanced delta connected 3-ph load. Using above relations, obtain the expressions for 3-ph active power and 3-ph reactive power.

c) A 80 kVA, 1000/250 V, 1-ph 50 Hz transformer has iron loss of 1000 W and copper loss 400 W, when its primary draws current of 50A. Calculate **[8]**

i) Efficiency at full load and power factor = 0.8 lag.

ii) Efficiency at half load and power factor = 1 lag.

OR

Q4) a) What are the losses in the transformer? State the parts in which they take place. **[3]**

b) Derive the EMF equation of single phase transformer. **[6]**

c) Three identical impedances each of 6+j8 Ω are connected in star across 3-ph, 415 V, 50 Hz ac supply. Determine **[8]**

i) Line voltage

ii) Phase voltage

iii) Phase current and line current

iv) 3-ph active, reactive and apparent power

Q5) a) Define the practical voltage source & explain it by means of **[4]**

i) Symbol of representation

ii) Value of internal resistance

iii) Graphs between V and I

b) Derive the equations to convert Delta connected resistive circuit into equivalent Star circuit. **[6]**

c) For the circuit given in fig 5c, write down the steps to find current through PQ using Superposition Theorem. **[8]**

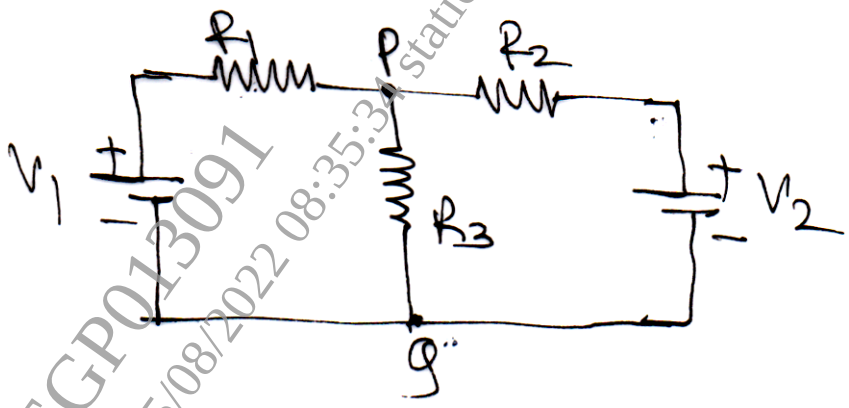

Figure 5c

OR

Q6) a) State and explain KCL & KVL **[4]**

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

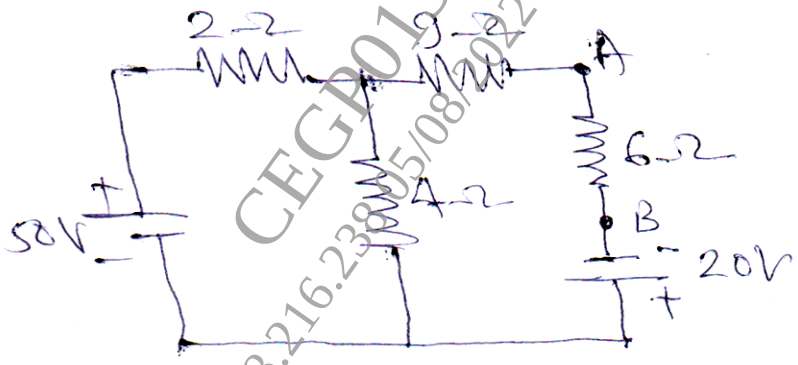

Figure 6b

c) Calculate the current flowing through 6 Ω (AB) for the circuit shown in question 6b, using Thevenin's Theorem. **[8]**

Q7) a) Define resistivity of the material & state the factors on which it depends. **[3]**

b) Explain construction and working principle of Lithium Ion battery and state it's any two applications. **[6]**

c) Derive an expression for insulation resistance of a single core cable. Draw the necessary diagram. Also comment on insulation resistance when **[8]**

i) Two cables are connected in series and

ii) In parallel

OR

Q8) a) Write the name of materials used for anode, cathode and electrolyte in case of Lead Acid Battery. State it's any three applications. **[3]**

b) If α_1 and α_2 are the RTC of a conducting material at t_1^0C and t_2^0C respectively prove that $\alpha_2 = \frac{\alpha_1}{1+\alpha_1(t_2-t_1)}$ **[6]**

c) A water pump lifts 12000 litre of water to a height of 15 m per minute. The efficiency of motor and pump is 75% & 80% respectively. Calculate **[8]**

i) Input power to motor in kW

ii) Daily energy consumption if pump is used 04 hrs a day

iii) Monthly electricity bill as per above daily uses for the month of 30 days at the rate of 10 Rs/unit.