

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 4

P6489

[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 5Ω , 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) 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 its 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 $6+j8 \Omega$ 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]

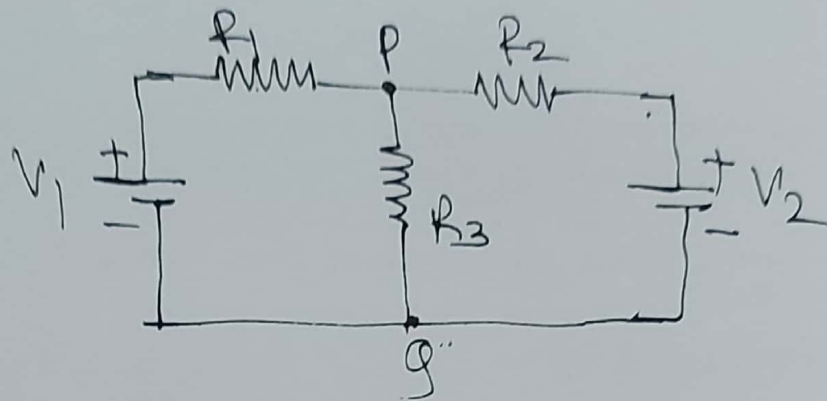


Figure 5c

OR

- Q6) a) State and explain KCL & KVL [4]
 b) Calculate the current flowing through $6\ \Omega$ (AB) for the circuit shown in fig 6b, using Kirchhoff's Laws. [6]

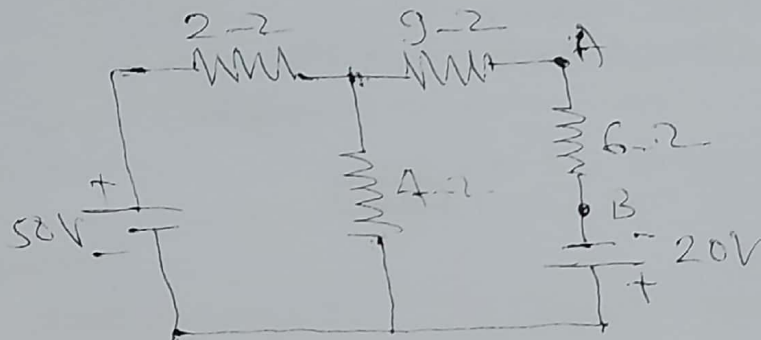


Figure 6b

- c) Calculate the current flowing through $6\ \Omega$ (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 its 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 its any three applications. [3]

b) 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 $\alpha_2 = \frac{\alpha_1}{1 + \alpha_1(t_2 - t_1)}$ [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.

