

Total No. of Questions : 8]

SEAT No. :

PE899

[Total No. of Pages : 4

[6581]-1905

F.E. (All Branches)

BASIC ELECTRICAL ENGINEERING

(2019 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-programmable calculator is allowed.

Q1) a) Define admittance. State its units. Express admittance in rectangular & polar form. [4]

b) Obtain the expression for current when voltage $v = V_m \sin \omega t$ is applied across purely inductive circuit. Also draw the waveform for voltage & current against time as a common X-axis. [6]

c) A series R-L-C circuit has resistance of 50 ohms, inductance of 0.1 H and capacitance of 50 micro farads connected across single phase 230 V, 50 Hz AC supply. [8]

Calculate:

- i) Inductive reactance
- ii) Capacitive reactance
- iii) Impedance
- iv) Current drawn by circuit
- v) Power factor of the circuit
- vi) Active & Reactive power consumed by the circuit.

OR

P.T.O.

- Q2)** a) Draw power triangle for R-L series circuit. Define active power and state its unit. [4]
- b) Derive the expression for resonant frequency in case of series RLC a c circuit. Draw phasor diagram. [6]
- c) A series RC circuit consisting of a resistance of 50 ohm and capacitance of 100 micro farad. It is supplied by 1-ph 230 V, 50 Hz AC supply. Calculate: [8]
- Capacitive reactance
 - Impedance of the circuit
 - Current through the circuit
 - Voltage across resistance
 - Voltage across capacitance
 - Power factor of circuit
 - Power consumed by circuit. Also draw a neat phasor diagram

- Q3)** a) Define: [3]
- Phase sequence
 - Balanced load
 - Unbalanced load
- b) Derive emf equation of a single phase transformer. [6]
- c) Three identical impedances each of $6 + j 8$ are connected in star across 3 phase 400 V 50 Hz supply. Determine: [8]
- Phase current
 - Line current
 - Line & phase voltage
 - 3-phase active, reactive and apparent power.

OR

- Q4)** a) State the relation between
- Phase voltage and line voltage
 - Phase current and line current in case of balanced delta connected 3-phase load. Write down the expression for 3 phase active power. [3]
- b) Differentiate core type & shell type transformer construction. (any 6 points). [6]
- c) A 25 kVA, 50 Hz single phase transformer has iron loss and full load copper loss of 350 watts and 400 watts respectively. Calculate its efficiency at: [8]
- 50 % of full load, at unity power factor and
 - 75 % of full load at 0.8 lagging power factor.

- Q5) a)** Explain active & passive networks with respect to D C resistive network. [4]
- b)** Derive the expression to convert given delta connected resistances into equivalent star connected resistances. [6]
- c)** Using Kirchoff's Law, determine the current I_1 & I_2 . Hence find current in 4 ohm resistance shown below in Fig. 5c. [8]

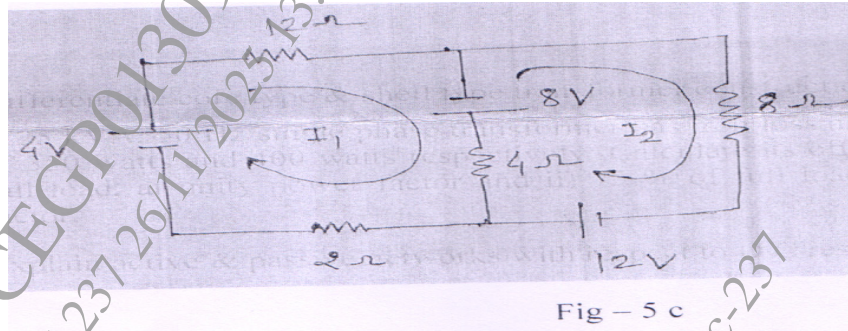


Fig - 5 c

OR

- Q6) a)** State and explain Kirchoff's laws. [4]
- b)** Apply Superposition theorem to calculate current flowing in 4 ohms resistance for the network shown below in Fig. 6b [6]

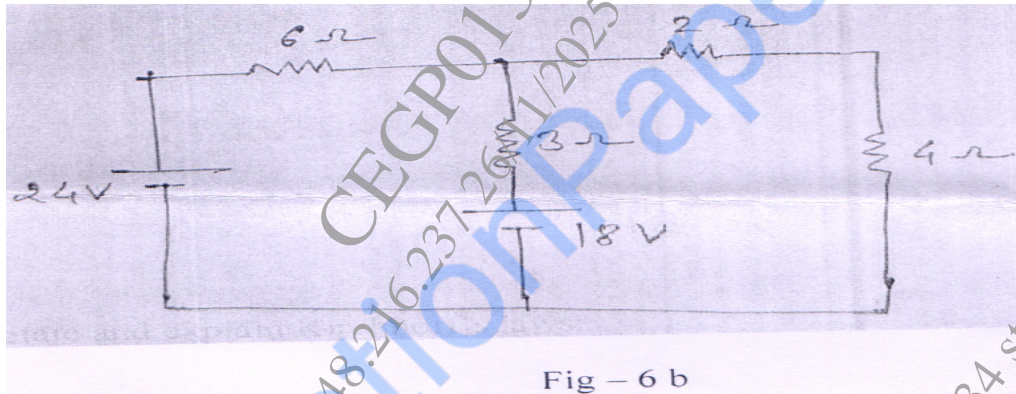


Fig - 6 b

- c)** Determine the current in 8 ohms resistance connected across A and B by Thevenins theorem (Ref. Fig -6c). [8]

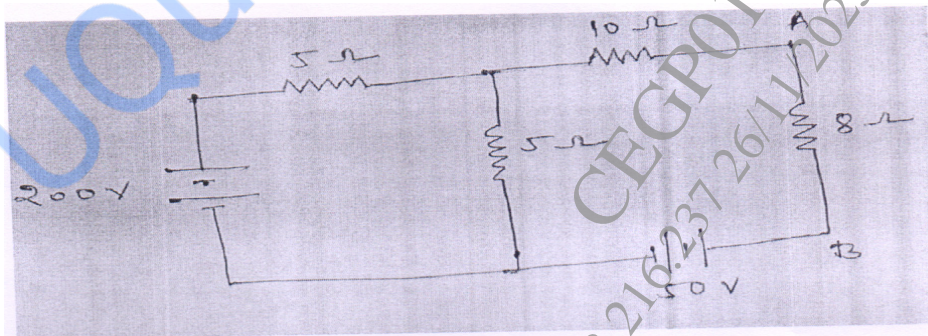


Fig - 6 c

- Q7)** a) What are the indications of a fully charged lead acid battery? [3]
- b) With usual notations derive the expression $\alpha_2 = \alpha_1 / (1 + \alpha_1[t_2 - t_1])$. [6]
- c) An electric pump lifts 1.2 m^3 of water per minute to a height of 15 meters. The overall efficiency of pump & motor is 60%. Calculate the input power. If the pump is used 4 hours daily, calculate energy consumption for a month of 30 days at the rate of Rs. 5 per unit. [8]

OR

- Q8)** a) State any three applications of Li Ion battery. [3]
- b) A single core Copper cable has conductor diameter of 3 cm & insulation thickness of 2 cm. The resistivity of copper & insulation is 1.73×10^{-8} ohm meter & 9×10^{12} ohm meter respectively. Determine: [6]
- i) Resistance of conductor &
- ii) Insulation resistance of the cable for 150 m length.
- c) Explain with neat sketch the construction and working of a lead acid battery and state its any two applications. [8]

