Total No. of Questions : 8]

SEAT No. : [ ]

PB3590

[Total No. of Pages : 3

[6260]-5

F.E. (All Branches)

BASIC ELECTRICAL ENGINEERING

(2019 Pattern) (Semester - I & II) (Credit System) (103004)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable electronic pocket calculator is permitted.***

Q1) a) Derive the expression for resonant frequency in a series RLC circuit. **[4]**

b) Prove that a pure inductor excited by sinusoidal voltage source never consumes any power. Draw the circuit diagram and write all necessary equations in steps. **[6]**

c) A voltage given by $v = 200 \sin \omega t$ is applied across 50 Ω pure resistor. Obtain the expressions for instantaneous current and instantaneous power for this circuit. Also calculate rms value of current and power consumed. **[8]**

OR

Q2) a) Define admittance of a circuit and hence draw the admittance triangle for a capacitive circuit. **[4]**

b) Obtain the expressions for instantaneous power and average power in a series R-L circuit excited by purely sinusoidal voltage. **[6]**

c) An R-C series circuit dissipates 100 W at 0.75 leading power factor when connected across single phase. 230 V, 50 Hz sinusoidal AC supply. Calculate: **[8]**

i) current drawn

ii) impedance in polar and rectangular form

iii) resistance of the circuit and

iv) value of capacitance

P.T.O.

Q3) a) Define the following terms in the context of polyphase AC circuits: **[3]**

i) Symmetric AC supply

ii) Phase sequence

iii) Balanced Load

b) Derive the emf equations of a single phase transformer. **[6]**

c) A delta connected balanced load consists of three coils; each of resistance 6 Ω and inductive reactance 8 Ω supplied by 400V, 3-phase AC. Determine **[8]**

i) impedance per phase

ii) phase current and line current

iii) power factor of the circuit

iv) total power absorbed

OR

Q4) a) State any three advantages offered by an autotransformer. **[3]**

b) A direct loading test is performed on a 1 KVA, 230V/115 V, 50 Hz single phase transformer. Draw the connection diagram showing all necessary measuring instruments with appropriate ranges and determine the rated primary and secondary current. **[6]**

c) Obtain the relationship between line current and phase current, line voltage and phase voltage for 3-phase star connected balanced inductive load with the help of neat circuit diagram and phasor diagram. Assume phase sequence as RYB. **[8]**

Q5) a) A practical voltage source supplies a load resistance R_L Draw the circuit representation and the V_L - I_L characteristics of this arrangement. **[4]**

b) Obtain the formulae for converting a delta connection of resistors into its equivalent star connection. **[6]**

c) Write the Kirchhoffs Voltage Law equations for the circuit shown in Fig. below and hence find the current through branch AB. All resistance values are in Ω. **[8]**

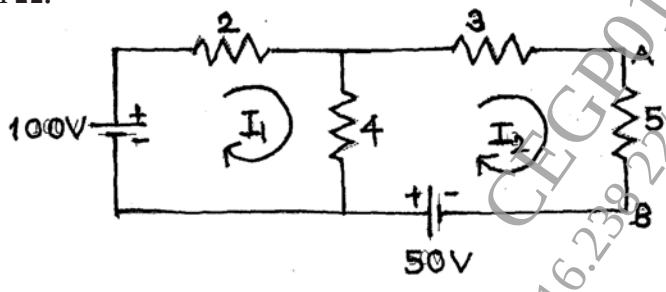

Fig. Q.5 (c)

OR

Q6) a) State and explain Kirchhoff's Laws for DC circuits. **[4]**

b) Find the equivalent resistance obtained across B and C terminals for the circuit shown in Fig. below. All resistance values are in Ω. **[6]**

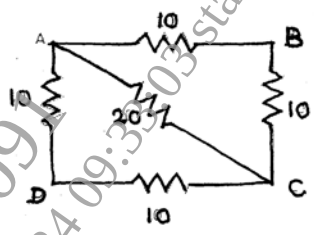

Fig. Q. 6 (b)

c) State Superposition Theorem. Explain the steps to apply Superposition Theorem for finding the current through branch A B of the circuit shown in fig. below. **[8]**

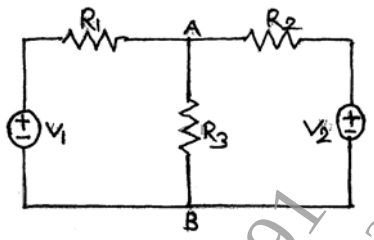

Fig. Q. 6 (C)

Q7) a) Specify the following in case of a Lithium Ion Battery: **[3]**

i) Cathode material

ii) Anode material

iii) Electrolyte material

b) Prove that $\alpha_2 = \dfrac{\alpha_1}{1+\alpha_1(t_2 - t_1)}$ where all terms have their usual meaning. **[6]**

c) Define insulation resistance and hence derive an expression for insulation resistance of a single core cable. **[8]**

OR

Q8) a) Define resistance temperature coefficient (RTC) and write its unit. **[3]**

b) An electric pump lifts 72 m^3 of water per hour to a height of 15 m. If the overall efficiency of the system is 70 %, find the input power. If the pump is used for 4 hours in a day, find the daily cost of energy at Rs. 10 per unit. **[6]**

c) Explain the following in case of a Lead Acid Battery: **[8]**

i) Construction and working

ii) Maintenance procedure

iii) Any two applications