Total No. of Questions : 8]

SEAT No. : ____

PC-1679

[Total No. of Pages : 4

[6351]-105
F.E. (All Branches)
BASIC ELECTRICAL ENGINEERING
(2019 Pattern) (Semester - I/II) (103004)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or 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 case of an RLC series circuit. **[4]**

b) Obtain an expression for instantaneous current in a pure capacitance excited by a sinusoidal voltage source. Hence obtain the instantaneous and average power. **[6]**

c) An AC voltage given by e = 200 sin 100πt is applied to a load having R = 200 Ω in series with L = 638 mH. Find (i) Expression for current (ii) power consumed by load (iii) Reactive power of load (iv) voltage across R and L. **[8]**

OR

Q2) a) Define admittance of an AC circuit. Write the admittance in complex form for an inductive circuit and state the meaning of each term. **[4]**

b) Obtain the expression for average power drawn by an R-L series circuit when excited with a sinusoidal voltage source. Hence draw the power triangle. **[6]**

c) A resistance of 10 Ω is connected in series with a pure capacitor of 150 μF. The circuit is connected across a 100V, 50Hz supply. Calculate (i) impedance of circuit (ii) power factor of circuit (iii) current in the circuit (iv) voltages across resistor and capacitor (v) active, reactive and apparent power in the circuit. **[8]**

P.T.O.

Q3) a) Define the following terms as applicable to a three phase AC system : **[3]**

i) Symmetric AC supply

ii) Phase sequence

iii) Balanced load

b) Derive an expression for emf induced in a single phase transformer. **[6]**

c) A balanced 3- phase load consists of three coils, each of series combination of 6 Ω resistance and 8 Ω inductive reactance. Determine the line current and power absorbed when the coils are (i) star-connected and (ii) delta-connected across 400V, 3-phase supply. **[8]**

OR

Q4) a) State and explain principle of working of a single phase transformer. **[3]**

b) State the relationship between line and phase voltage, Line and phase current in case of three phase star connected balanced load. Hence, obtain the expression for 3-ph power. **[6]**

c) A direct loading test is performed on a 1 kVA, 230 V/115 V, 50 Hz single phase transformer. Draw the connection diagram involving all necessary measuring instruments and determine the following : **[8]**

i) Full load primary and secondary current

ii) Range of ammeters and voltmeters

iii) Range of wattmeters

Q5) a) State and explain Kirchhof's Laws in the context of DC circuits. **[4]**

b) Obtain the formulae for converting a set of given delta connected resistances into equivalent star connection. **[6]**

c) Using Thevenin's theorem, find the current through 10 Ω resistor in following circuit. **[8]**

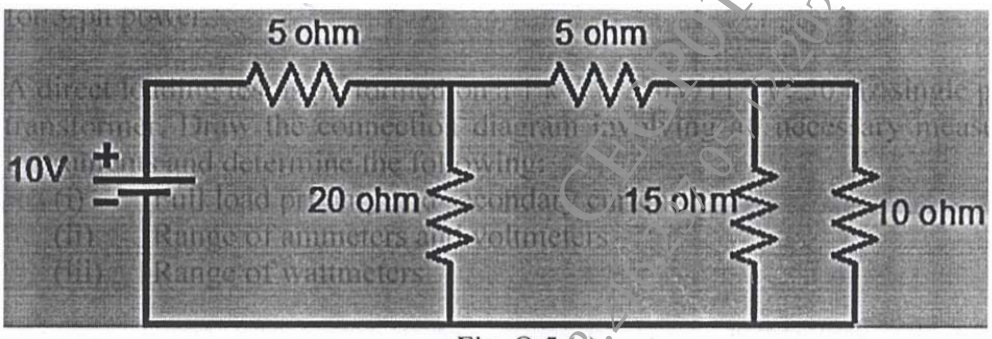

Fig. Q.5 (c)

OR

Q6) a) What is an ideal voltage source? Mention the following for an ideal voltage source : **[4]**

i) Diagrammatic representation

ii) Internal resistance value

iii) Voltage and output current characteristics

b) State the Superposition Theorem and apply it for finding current through AB for the circuit given below. Fig 6(b) **[6]**

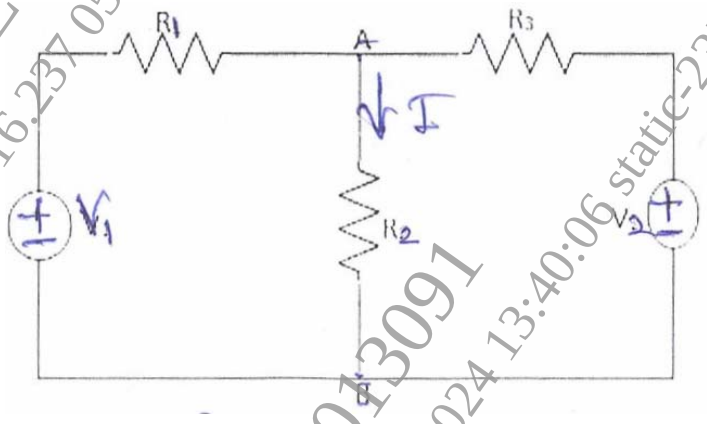

Fig 6(b)

c) Determine the effective resistance between terminals A and B for the circuit shown in Fig. below. **[8]**

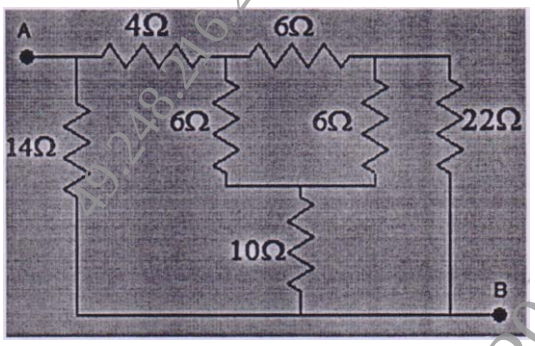

Fig. Q.6(c)

Q7) a) Explain the concept of depth of discharge (DoD) of a battery in brief. **[3]**

b) Derive an expression for insulation resistance of a single core cable. **[6]**

c) Explain the construction and working of a Lead Acid Battery and state it's any two applications. **[8]**

OR

Q8) a) State any three major precautions taken while maintaining a Lead Acid Battery. **[3]**

b) Explain the construction and working of a Lithium-Ion Cell and state it's any two applications. **[6]**

c) The electrical installation in a house is utilised as mentioned below:

i) 5 Tubelights, 18W each, for 12 hrs a day

ii) 3 ceiling fans, 60W each, for 10 hrs a day

iii) 2 electric ovens, 1.2 KW each, for 2 hrs a day

iv) 2 electric geysers, 3 KW each for 30 minutes a day

Calculate (i) Daily energy consumption in kWH (ii) total cost of energy at a rate of Rs.6 per unit for 30 days. **[8]**