Total No. of Questions : 8]

SEAT No. : [ ]

PD4028

[Total No. of Pages : 4

[6401]-1905

First Year Engineering (All Branches)

BASIC ELECTRICAL ENGINEERING

(2019 Pattern) (Credit System) (Semester - I/II) (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) ***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) For the Resonance in RLC Series circuit-Comment on reactance's, impedance, current & power factor. **[4]**

b) The R-L circuit when supplied by 180V, 50 Hz ac voltage, the voltage drop across the inductance is 150 V. The current drawn by the circuit is 5 A. Calculate: **[6]**

i) Inductive Reactance

ii) Inductance

iii) Resistance

iv) Impedance

v) Voltage across Resistance and

vi) P.F.

c) A voltage of V = V ∠0°V is applied across a R-L-C series circuit. Write the equation for impedance, current & comment on power factor --- when **[8]**

i) $X_L > X_C$

ii) $X_L < X_C$

Also draw the phasor diagram in each case.

OR

Q2) a) Define and state the unit of **[4]**

i) Admittance, susceptance,& conductance

ii) Impedance

b) If $v = V_m \sin(\omega t)$ is applied across single phase circuit and current flowing through the circuit is $i = I_m \sin\left(\omega t + \frac{\pi}{2}\right)$. Draw the circuit diagram & derive the expression for average power consumed in the circuit. **[6]**

c) A Pure resistance of 15Ω is connected in series with a pure inductor of 25mH. This series circuit is connected across 230V, 50-Hz supply. Find **[8]**

i) The Inductive Reactance

ii) Impedance

iii) Current

iv) Power factor

v) Phase angle

vi) Voltage across Resistor

vii) Voltage across inductor

viii) Draw the phasor diagram

Q3) a) State the advantages of three phase systems over single phase system. **[3]**

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

c) In a 3-phase Star-connected load, each phase has a an impedance of (50+j32) Ω. This load is fed from three phase supply voltage of 400 V with frequency of 50Hz. Calculate: **[8]**

i) Phase Voltage and Line Voltage;

ii) Phase Current and Line Current;

iii) Total Active Power, Reactive Power and Apparent Power consumed.

OR

Q4) a) State the different types of losses in the transformer. **[3]**

b) A 80 KVA, 3200/400V, 50Hz, single phase transformer has 111 turns on the secondary winding. Calculate **[6]**

i) Number of turns on primary side

ii) Primary & Secondary full load current

iii) Cross sectional area of the core if the maximum flux density is 1.2T

c) Derive the relationship between the line current and phase current, line voltage and phase voltage, for a balanced three phase STAR connected load across three phase AC supply. Draw the circuit diagram & required phasor diagram. Assume phase sequence RYB and inductive load. **[8]**

Q5) a) Compare the ideal & practical voltage source by means of **[4]**

i) definition

ii) Symbol & V-I characteristics.

b) Write the three steps to find current flowing through load resistance R_L using Thevenins Theorem for the circuit shown in Figure-5 (b). **[6]**

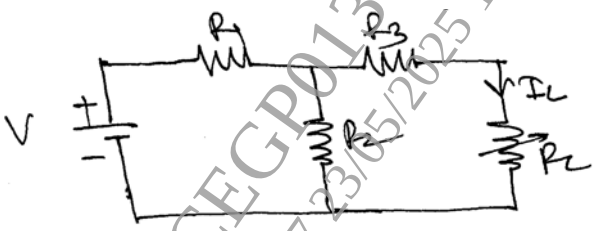

Figure-5 (b)

c) Derive the formulae to convert DELTA connected resistances into equivalent STAR connected resistances. Draw the circuit diagram in each case. **[8]**

OR

Q6) a) State and Explain Kirchhoffs Laws. **[4]**

b) Find the Resistance between terminal A and C. **[6]**

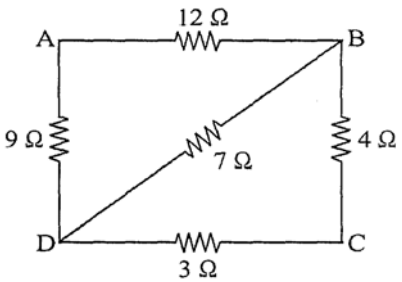

Figure-6 (b)

c) Find the current flowing through 5 Ω by applying Super Position Theorem. **[8]**

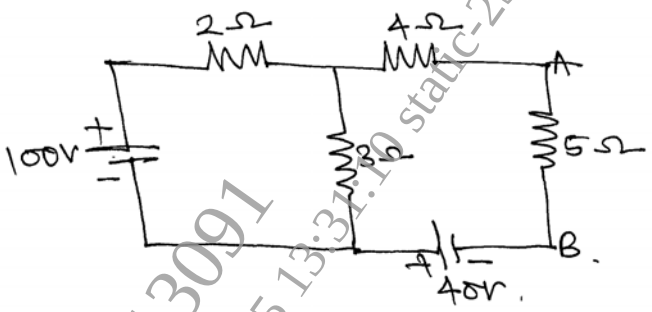

Figure 6 (c)

Q7) a) Comment on effect of increase in temperature on Resistance of **[3]**

i) metallic conductor

ii) alloys &

iii) insulators

b) Explain the construction and working of Lead acid battery. **[6]**

c) Derive the expression of insulation resistance of the single core cable. Draw the cut section diagram & label it. **[8]**

OR

Q8) a) State the 3 applications of lithium ion battery. **[3]**

b) With usual notations derive the expression **[6]**

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

c) Find the current flowing at the instant of switching 40 W, 240 V filament lamp. The temperature coefficient of resistance of filament is 5.5×10^{-3} per degree Celsius at 20°C. The working temperature of lamp is 2000°C. Also find the working current & compare it with starting current. **[8]**