17323

21819

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Use of Non-programmable Electronic Pocket Calculator is permissible.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any TEN of the following: **20**

a) Define waveform and instantaneous value of an alternating quantity.

b) An alternating voltage is having maximum value 230 volt. What is its average value and rms value?

c) Define inductive reactance and capacitive reactance.

d) Define power factor and reactive power.

e) Draw a admittance triangle by considering capacitive susceptance and inductive susceptance.

f) Give any two applications of parallel resonant circuits.

g) State the relations between line and phase value of voltage and current for balanced star connected load.

h) Define phase sequence of three phase ac quantity.

Marks

i) With a neat diagram explain the concept of open circuit.

j) Define active network and passive network.

k) State Thevenin's theorem applied to DC circuits.

l) Give the meaning of "Steady state condition and state the behaviour of pure C at steady state condition.

2. Attempt any FOUR of the following: **16**

a) Instantaneous expression for voltage and current are given by

$V = 141.4\sin 314\,t,\ i = 28.28\sin\left(314t + \frac{\pi}{3}\right)$.

Determine:

i) Voltmeter and ammeter reading.

ii) Frequency of current

iii) Power factor

iv) Power consumed.

b) Derive the expression for current and voltage in pure resistive circuit when connected to sinusoidal AC voltage. Draw the phasor diagram.

c) For the given impedance triangle as shown in Figure No. 1.

i) Identify the types of circuit.

ii) Mark parameters of all sides of the triangle

iii) State the nature of power factor

iv) Draw a sinusoidal waveform of voltage and current.

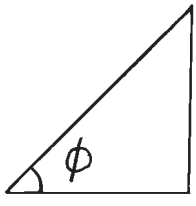

Fig. No. 1

d) Define the impedance and draw the impedance triangle.

Marks

e) A resistance of 100Ω and 50μf capacitor are connected in series across a 230V, 50Hz supply. Find :

i) The impedance.

ii) The current flowing through circuit.

iii) Voltage across resistance and capacitance.

iv) Power factor and power.

f) A circuit consists of a resistance of 20Ω in series with an inductance of 95.6 mH and a capacitor of 318 μf. It is connected to a 500V, 25Hz supply. Find the current in the circuit and power factor.

3. Attempt any FOUR of the following: **16**

a) Compare series resonance circuit with parallel resonance circuit.

b) Derive the expression for resonant frequency for the circuit as shown in Figure No. 2

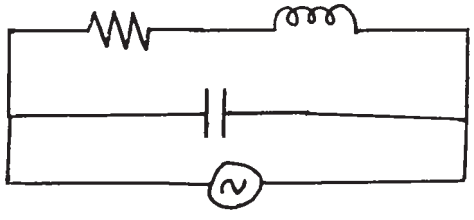

Fig. No. 2

c) If $z_1 = 3 + j7$ and $z_2 = 12 - j16$ are connected in parallel. Find the equivalent impedance of combination.

d) If A = 4 + j7, B = 8+ j9, c = 5 – j6 then calculate,

i) $\frac{A + B}{C}$

ii) $\frac{A \times B}{C}$

iii) $\frac{A + B}{B + C}$

iv) $\frac{B - C}{A}$

Marks

e) What is meant by independent voltage source? What are its type?

f) A resistance of 100Ω and 50μF capacitor are connected in series across a 230V, 50Hz supply find :

i) The impedance

ii) The current flowing through circuit.

iii) Voltage across resistance and capacitance.

iv) Power factor and power.

4. Attempt any FOUR of the following: **16**

a) Distinguish between balanced and unbalanced load.

b) State any four advantages of polyphase circuit over single phase circuit.

c) A 3ϕ star connected load having R = 15Ω, L = 0.04 H, C = 50 μF in each phase. It is supplied by 440V, 3ϕ, 50 Hz AC.

Find :

i) Impedance per phase (Zph)

ii) Line current

iii) Power factor

iv) Power consumed.

d) Derive the formulae for delta to star transformation.

e) Using mesh analysis calculate current through 10Ω resistor as shown in Figure No. 3.

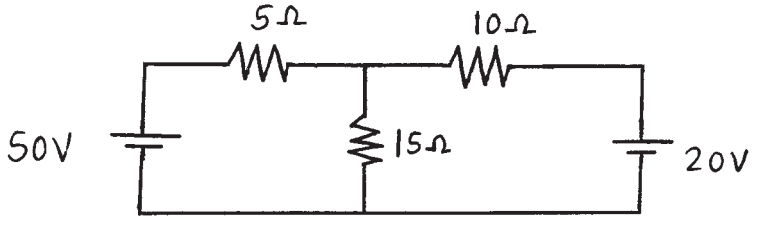

Fig. No. 3

Marks

f) Using Nodal analysis Calculate current through 15Ω resistor as shown in Figure No. 4.

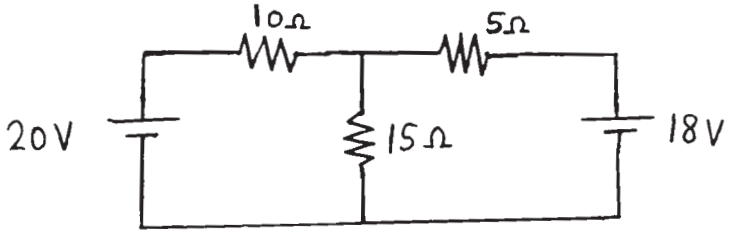

Fig. No. 4

5. Attempt any TWO of the following: **16**

a) Explain the generation of three phase emf for two pole machines. Represent them mathematical as well as graphical form.

b) i) State Norton's theorem and write its procedural steps of find current in a branch.

ii) Find the current passing load resistance R_L as shown in Figure No. 5.

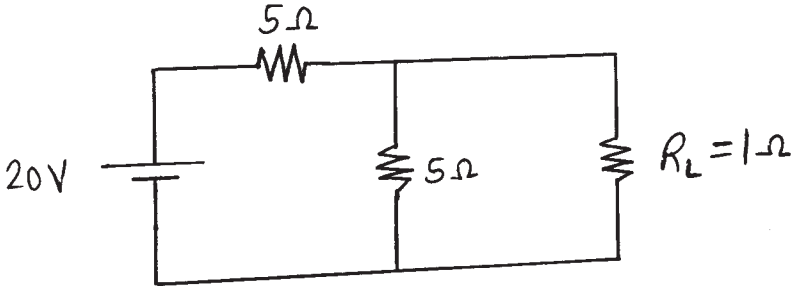

Fig. No. 5

c) i) State superposition theorem and write its procedural steps to find current in a branch.

ii) Find the I_L for the circuit shown in Figure No. 6 using superposition theorem.

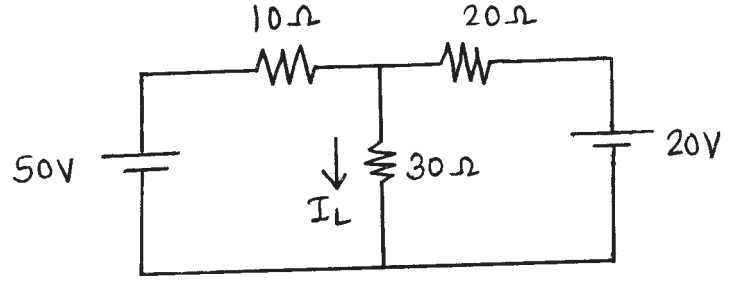

Fig. No. 6

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6. Attempt any FOUR of the following: **16**

a) Find current through branch AB using Thevenin's theorem as shown in Figure No. 7.

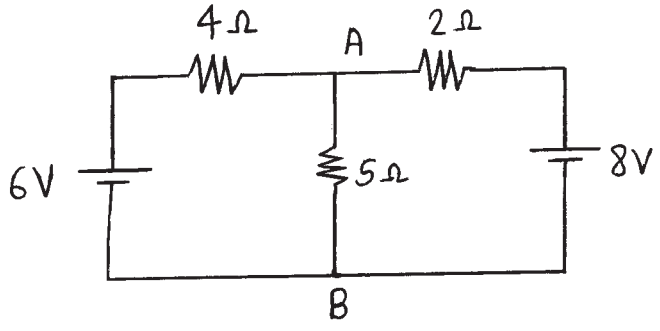

Fig. No. 7

b) Find the value of load resistance R_L to get maximum power transfer to it in Figure No. 8.

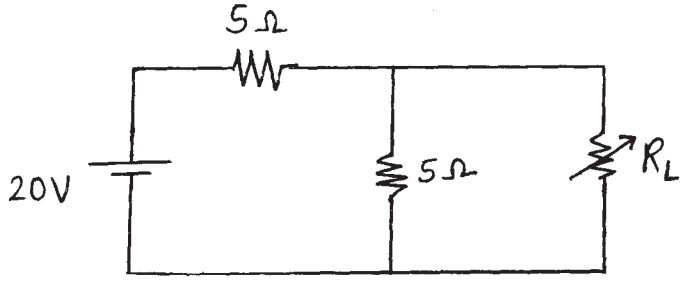

Fig. No. 8

c) Using Nodal voltage analysis find current through each branch in Figure No. 9.

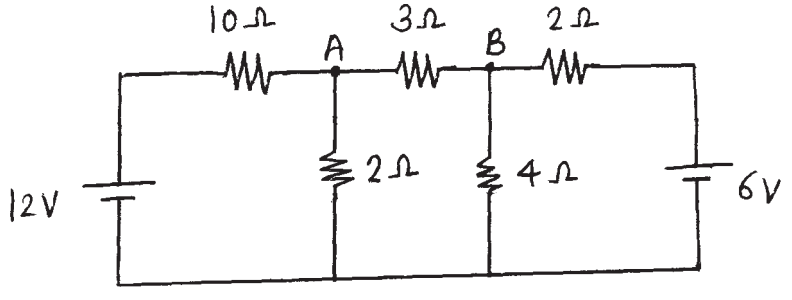

Fig. No. 9

Marks

d) Draw the curves for following parameters during series resonance condition with respect to frequency.

i) X_L

ii) X_C

iii) I

iv) Z

e) Explain the concept of initial condition and state switching circuits for the elements R, L and C.

f) Compare single phase system with three phase system by using following points.

i) Voltage

ii) Transmission efficiency.

iii) Size of machine to produce same output.

iv) Cross sectional area of conductor.