313332

3 Hours / 70 Marks   Seat No.

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

(2) Answer each next main Question on a new page.

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

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

Marks

1.   **Attempt any <u>FIVE</u> of the following:**   **10**

a) Define frequency and time period related to a.c. waveform.

b) Draw impedance triangle and phasor diagram for R-C series circuit.

c) Define Admittance related to AC circuit. State its SI Unit.

d) Draw phasor diagram for three-phase voltages. Express these voltages in polar form.

e) Draw an ideal and a practical current source. Write difference between them.

f) State the maximum power transfer theorem for DC circuits.

g) State Reciprocity theorem.

P.T.O.

2. **Attempt any THREE of the following:** 12

a) For series R-L-C circuit, draw neat circuit diagram. State the three conditions for R-L-C series circuit. Draw voltage triangle and impedance triangle for $X_L > X_C$.

b) A coil having resistance of 5Ω and an inductance of 0.2 H is connected in parallel with a series combination of 10Ω resistor and 80 μF capacitor. If supply voltage is 230 V, 50 Hz, determine :–

   i) Total circuit impedance

   ii) Total current taken by the circuit

   iii) Power factor of the circuit.

c) Three equal impedances having R = 20Ω in series with C = 50 μF are connected in delta across 415 V, 3 phase, 50 Hz AC supply. Determine :–

   i) Impedance per phase

   ii) Phase and line currents

   iii) Total power consumed by load.

d) State the equivalent delta R12, R23 and R31 for star connection of three resistances R1, R2 and R3 with proper equations for network shown in Figure No. 1 :

Fig. No. 1

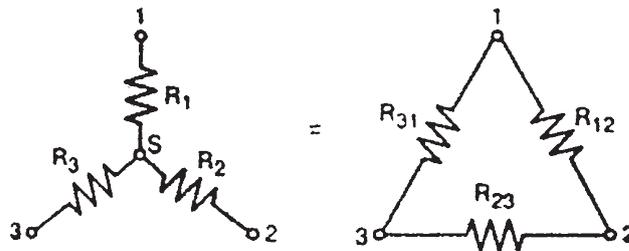**3.** **Attempt any THREE of the following:** 12

a) A series R-L-C circuit has R = 5Ω, L = 10 mH and C = 15μF. Calculate :–

   i) Resonant frequency

   ii) Q-factor of the circuit

   iii) Bandwidth

   iv) Voltage Magnification.

b) Explain the "Current Magnification" in parallel resonant circuit consisting of inductive branch (R-L) in parallel with a pure capacitor (C). Derive equation for it.

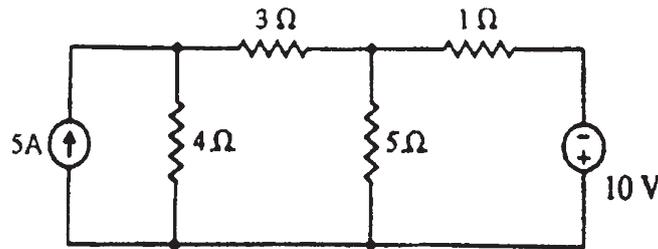c) Using mesh analysis, find current in 5Ω resistor in the network shown in Figure No. 2.

Fig. No. 2

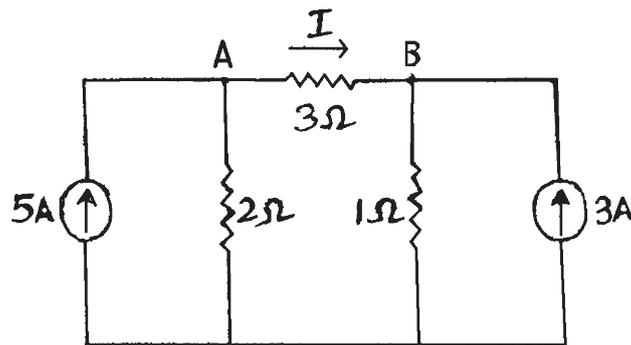d) Using Node analysis, find current I in the circuit shown in Figure No. 3.

Fig. No. 3

4.   **Attempt any THREE of the following:**   **12**

a) Two circuits the impedance of which are given by $Z_1 = (6 + j8)$ ohm and $Z_2 = (8 - j6)$ ohm are connected in parallel. If the applied voltage to the combination is 100 V, Find by impedance method :–

   i)   Current at each branch

   ii)   Overall current

   iii) Power factor of the combination.

b) Compare parallel resonance with series resonance on the basis of :–

i) Impedance

ii) Current

iii) Magnification

iv) Resonant frequency.

c) With neat circuit diagram, explain how to convert a practical voltage source into an equivalent practical current source.

d) Write stepwise procedure for applying Thevenin's theorem to simple circuits. (Assume simple circuit)

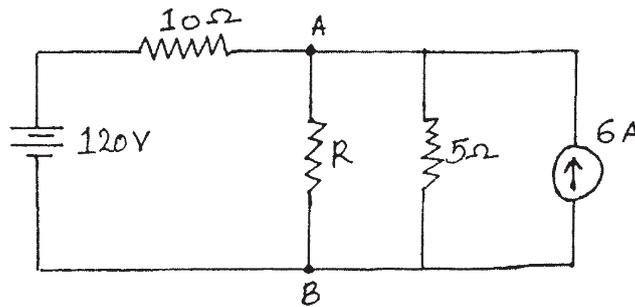e) Calculate the value of R which will absorb maximum power from the circuit of Figure No. 4.

Fig. No. 4

5. **Attempt any TWO of the following:** 12

a) For a series R-L-C circuit consisting of R = 5Ω, L = 0.01 H and C = 10 μF supplied with 230 V, 50 Hz supply, Determine :–

i) Circuit impedance

ii) Circuit current

iii) Circuit power factor

iv) Active power

v) Reactive power

vi) Apparent power.

b) In a 3 phase star connected system, derive the relationship $V_L = \sqrt{3}\ V$ ph.

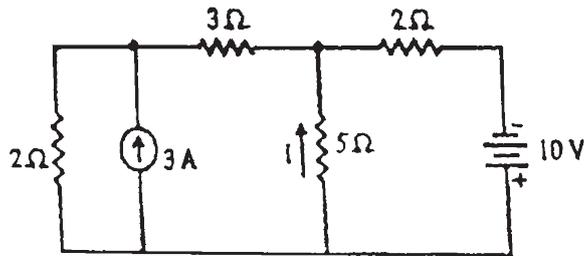c) Apply superposition theorem to compute current I in the network shown in Figure No. 5.

Fig. No. 5

6. **Attempt any TWO of the following:** 12

a) Explain Graphical Representation of Resonance in R-L-C series circuit.

b) A balanced delta connected load, consists of per phase impedance of $(5 + j7)\Omega$. It is supplied with 415 V, 50 Hz, 3 phase AC supply. Calculate :–

   i) Line current

   ii) Phase current

   iii) Phase voltage

   iv) Total power absorbed

   v) Power factor of the combination.

   Also draw vector diagram.

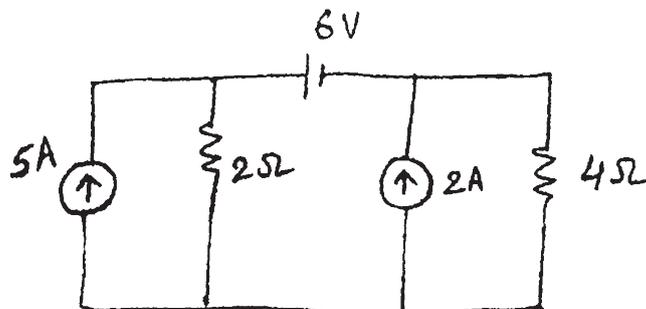c) By Norton's theorem, find the current in 4Ω resistor in the network shown in Figure No. 6.

Fig. No. 6

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