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

(2) Illustrate your answers with neat sketches 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 permissible.

(6) 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 impedance and power factor.

b) Define Active power and Reactive power.

c) Define Bandwidth of parallel resonance circuit.

d) Draw a three phase voltage waveform with respect to time.

e) State The four important steps to solve node analysis.

f) State Thevenin's theorem.

g) State Norton's theorem.

Marks

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

a) A resistance of $100\,\Omega$ and 50 μF capacitor are connected in series across 200 V, 50 Hz. Find the voltage across resistance and capacitor.

b) Calculate supply current and power factor, if impedance $Z_1 = (3 + j4)\,\Omega$ and $Z_2 = (4 + j3)\,\Omega$ are connected in parallel across 200 V, 50 Hz supply. Calculate supply current and power factor.

c) State the voltage and current relationship in terms of line and phase value for three phase star connected system and also write the equation for total power in terms of line and phase values of voltage and current.

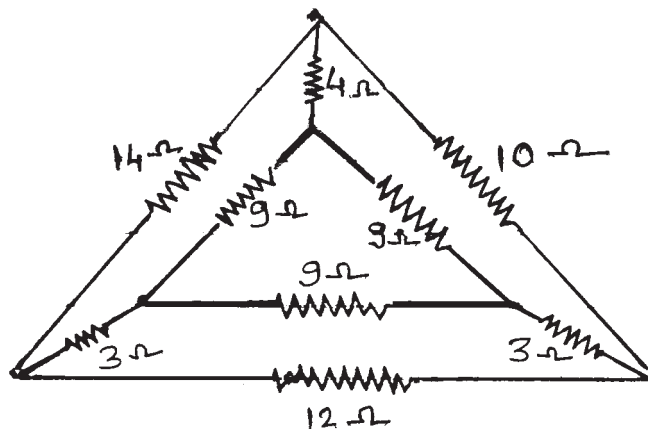d) Reduce the following network to a single delta form made up of three resistance only.

Fig. No. 1

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

a) Derive the expression of resonant frequency in RLC series circuit.

b) A coil having resistance of $10\,\Omega$ and Inductance of 0.1 H is connected in parallel with a capacitor of 10 μF across a 200 V, 50 Hz supply. Find the current taken from the supply and overall power factor. Draw a neat phasor diagram.

c) Three resistance of $15\,\Omega$, $12\,\Omega$, and $18\,\Omega$ are connected in delta. Find equivalent value of them if they connect in star.

d) Find the current through 20 Ω Resistor of the following Fig. No. 2 using Node Analysis.

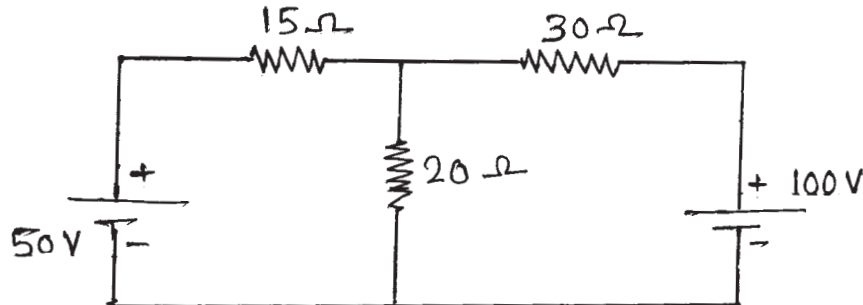**Fig. No. 2**

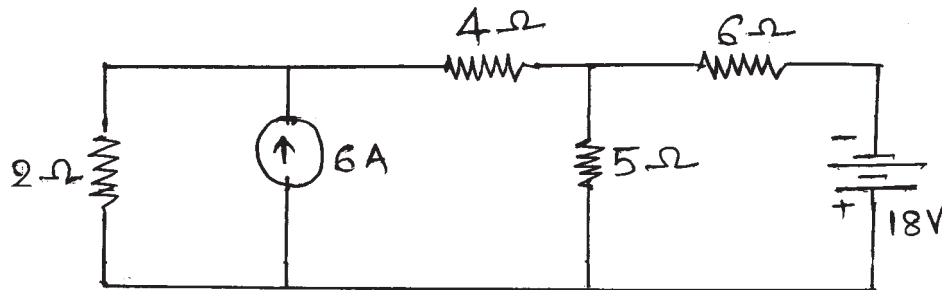e) Find the current through 5 Ω Resistor of the following using Thevenin's theorem.

Fig. No. 3

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

a) A series circuit consist of R = 14 Ω, L = 0.07 H and C = 210 µF. Find –

i) Resonance frequency

ii) Quality factor

b) A single AC circuit containing resistor of 30 Ω and inductor of 0.15 H are connected in parallel across 230 V, 50 Hz supply. Determine –

i) Admittance

ii) Circuit current

iii) Power factor

iv) Power consumed

Marks

c) State the meaning of three phase balance and unbalance load.

d) State and explain Reciprocity theorem.

5. Attempt any TWO of the following : 12

a) Define quality factor for RLC parallel circuit and also derive the expression for the Q - factor related to parallel circuit.

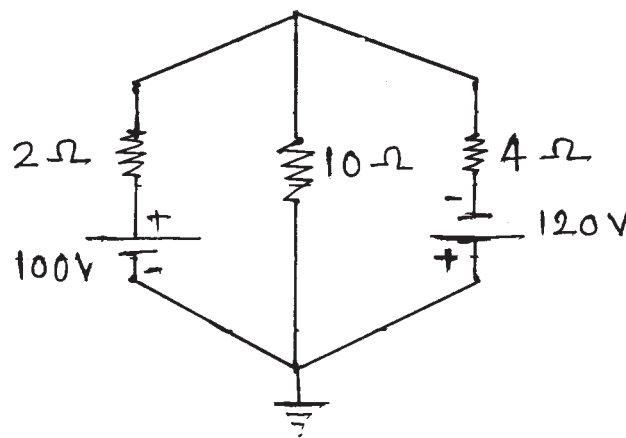b) Find the current through $10\,\Omega$ Resistor of the circuit using Mesh analysis.

Fig. No. 4

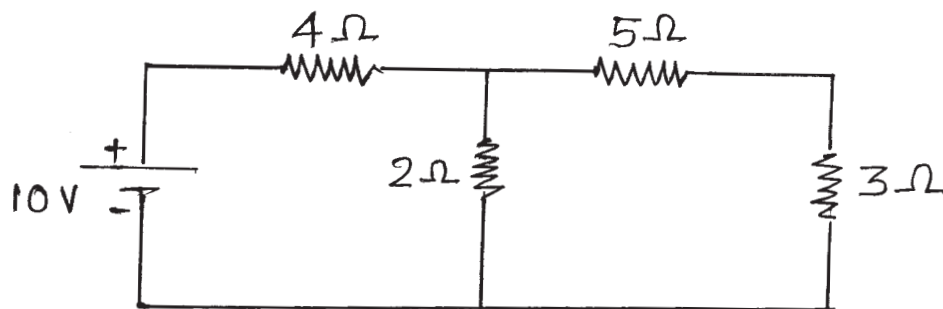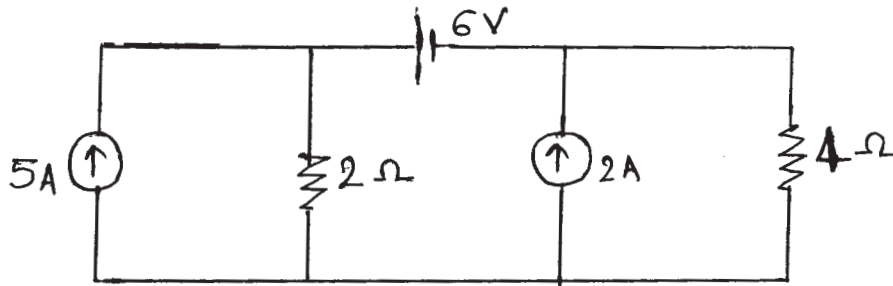c) Find the current flowing through $3\,\Omega$ resistor using Norton's theorem.

Fig. No. 5

Marks

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

a) For a series RLC circuit consisting of R = 16Ω, X_L = 18Ω and X_C = 6Ω supplied with 100 V, 50 Hz supply. Determine –

   i) Circuit Impedence and circuit current

   ii) Circuit power factor and power consumed by the circuit.

b) Three identical coils, each having resistance of 15Ω and inductance of 0.03 H are connected in Delta across three phase, 400 V, 50 Hz, supply. Calculate –

   i) Phase current

   ii) Line current

   iii) Power factor

   iv) Total power consumed

c) Find the current through 4Ω resistor using Superposition theorem.

Fig. No. 6

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