22324

22223

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 answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

Marks

1. Attempt any FIVE of the following: **10**

a) Draw impedance triangle and phasor diagram for R L series circuit.

b) Define quality factor for parallel resonance and write its mathematical expression.

c) Define balanced 3 phase load.

d) Define power factor and state its value for pure resistance.

e) State maximum power transfer theorem.

f) Give equations of delta to star transformation.

g) State superposition theorem.

Marks

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

a) Explain the generation of single phase AC supply by an elementary alternator with neat diagram.

b) Impedance $Z_1 = (10 + j5)\Omega$ and $Z_2 = (8 + j6)\Omega$ are connected in parallel across $V = (200 + j0)$ using the admittance method. Calculate the circuit current and branch currents.

c) Give four advantages of three phase circuits over single phase circuits.

d) Using mesh analysis, find current I in the circuit shown in Figure No. 1.

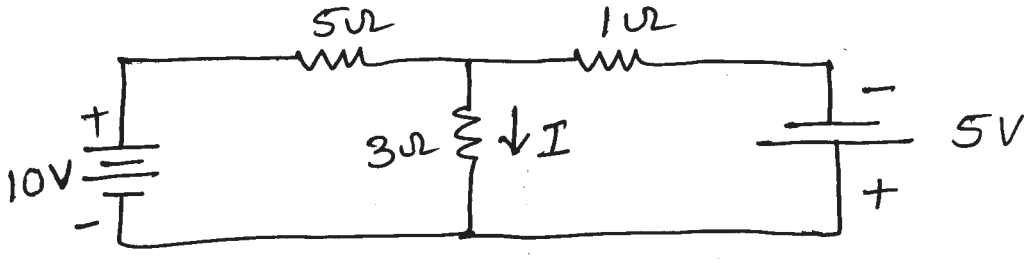

Figure No. 1.

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

a) A series RLC circuit is connected to 230 V, 50 Hz single phase supply. The value of R = 5 Ω, L = 13 mH, C = 140 μF. Find the

i) Total reactance

ii) Impedance

iii) Current drawn

iv) Power factor

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

Marks

c) Using nodal analysis, find current I in the circuit shown in Figure No. 2.

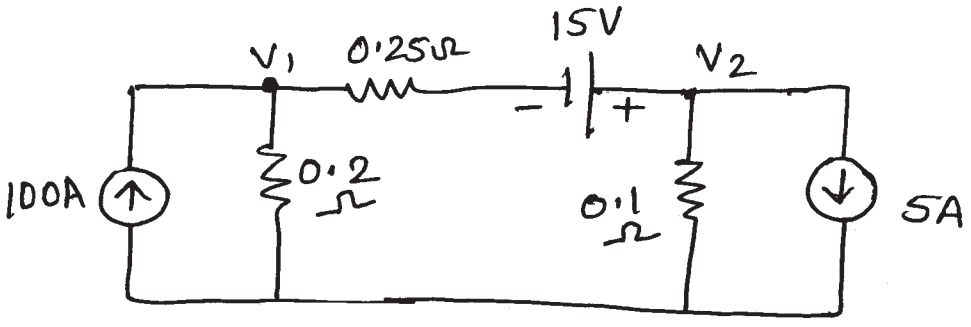

Figure No. 2.

d) Compare series resonance and parallel resonance on any four points.

e) State the Thevenin's theorem. Also write stepwise procedure for applying Thevenin's theorem to simple circuits.

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

a) A voltage of $(200 \angle 53.13)$ V is applied across two impedance in parallel. The values of the impedance are $(12 + j16)\Omega$ and $(10 - j20)\Omega$.

Determine

i) Active power

ii) Reactive power

iii) Apparent power in each branch and current in each branch.

b) A RLC series circuit with a resistance of 20Ω, inductance of 0.25 H and capacitance of $100\mu F$ is supplied with 240 V variable AC supply, Calculate

i) Resonance frequency

ii) Current at this condition

iii) Power factor

iv) Quality factor

Marks

c) Explain neutral shift in case of 3ϕ star connected un balanced load with diagram.

d) With neat circuit diagram, explain the concept of duality in electric circuit. State any four examples (pairs) of duality in electric circuit

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

a) Derive the formula for star to delta transformation.

b) A coil having resistance of 10 Ω 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 in the coil and capacitor. Also find the current taken from the supply and overall power factor. Draw a neat phasor diagram and circuit diagram.

c) By Norton's theorem, find the current in 4 Ω resistor in the network shown in Figure No. 3.

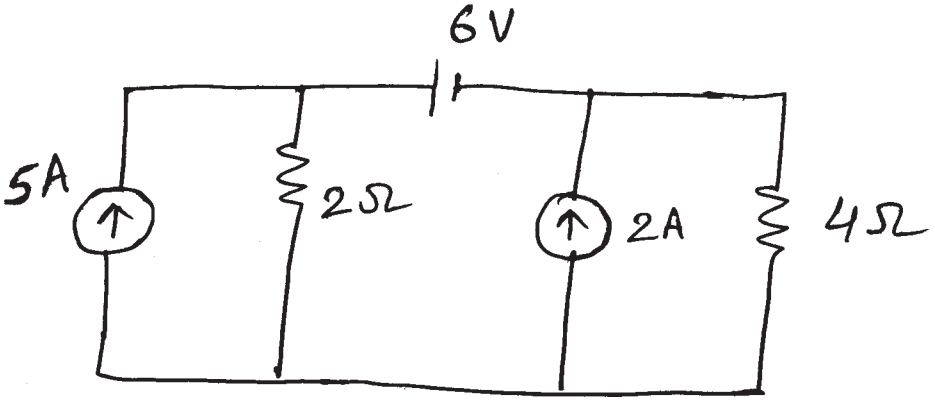

Figure No. 3.

Marks

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

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

Find :

i) Impedance

ii) Current flowing

iii) Voltage across resistance and capacitance

iv) Power factor and power

b) Determine the current in 5 Ω resistor in the network given by superposition theorem. Refer Figure No. 4.

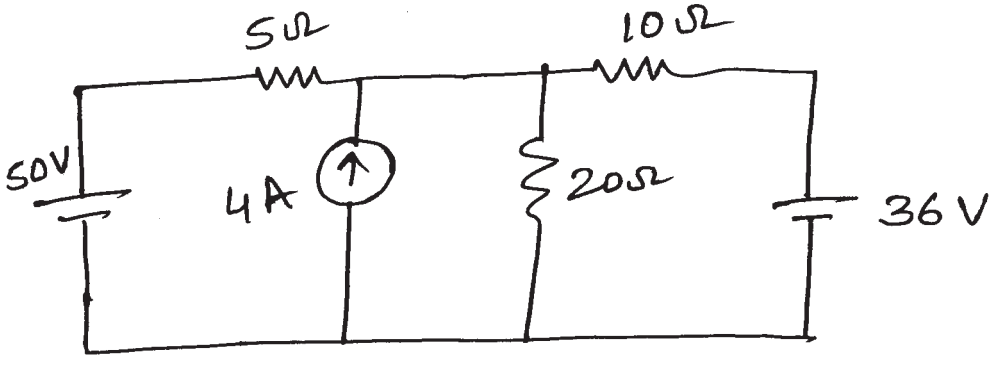

Figure No. 4.

c) A balanced delta, consists of per phase impedance of (5 + j7) Ω. It is supplied with 200 V, 50 Hz 3ϕ AC supply. Calculate line current, phase current, phase voltage, total power absorbed and power factor of the combination. Also draw vector diagram.
