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03 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 FIVE of the following: **10**

a) State the term "Phase" and "Phase difference" in case of alternating qualities.

b) Draw voltage and current responses for a pure inductive circuit.

c) State the term "conductance" and "susceptance" in case of single phase parallel circuit.

d) State any four advantages and 3-phase circuit over 1-phase circuit.

e) Give concept of ideal voltage and current source.

f) State reciprocity theorem.

g) State any two differences between DC Network and AC Network theorems.

P.T.O.

Marks

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

a) Two impedances Z_1 = (15 + j 12.56) Ω Z_2 = (10 + j31.4) Ω are connected in series with a capacitance of 100 μf and supplied through 230V, 50Hz A.C. source. Find current drawn and voltage across each impedance.

b) Two impedances Z_1 = (10 + j5)Ω and Z_2 = (8 + j6)Ω are joined in parallel and connected across a voltage of V = 200∠0° volt. Calculate the circuit current branch current and draw the vector diagram.

c) With the help of vector diagram derive the relationship between line valves and phase valves for balanced delta connected system.

d) Use source conversion technique to find the load current I for the Figure No. 1.

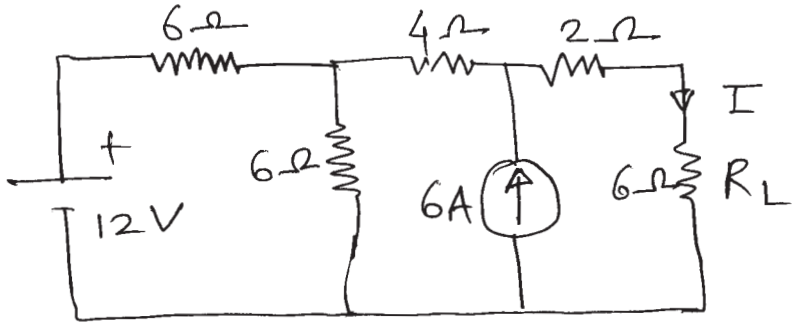

Fig. No. 1

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

a) A capacitor and resistor are connected in series to an A.C. supply of 50V, 50Hz. The current is 2A and the power dissipated in the circuit is 80W. Calculate the values of resistance and capacitance.

b) Two impedances Z_1 = (8 + j6) Ω and Z_2 = (3 – j4) are in parallel. If the total current of the combination is 25A, find the current taken and power consumed by each impedance.

Marks

c) A 3 – ϕ, 400V, 50 Hz, A.C. supply is feeding a 3 – ϕ delta connected load with each phase having a resistance of 25Ω, an inductance of 0.15H and a capacitor of 120μf in series. Determine :–

i) Z_{Ph}

ii) I_{Ph}

iii) I_L

iv) P.f.

d) Using nodal voltage method, find the magnitude and direction of current in 10Ω connected across AB in the network shown in Figure No. 2.

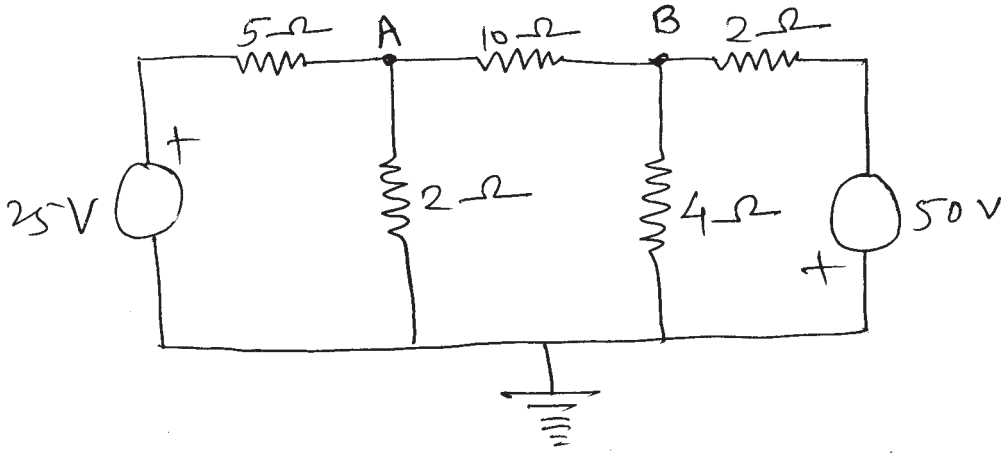

Fig. No. 2

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

a) A voltage ν(t) = 100 sin 314 t is applied to series circuit consisting of 10Ω resistance, 0.0318 henery inductance and a capacitor of 63.6 μf.

Calculate:

i) Expression for *i*(t)

ii) Phase angle between voltage and current.

iii) Power factor and

iv) Active power.

Marks

b) Draw graphical representation of series resonance and state meaning each term marked on graph.

c) With the help of superposition theorem, compute the current flowing between points A and B for the Figure No. 3.

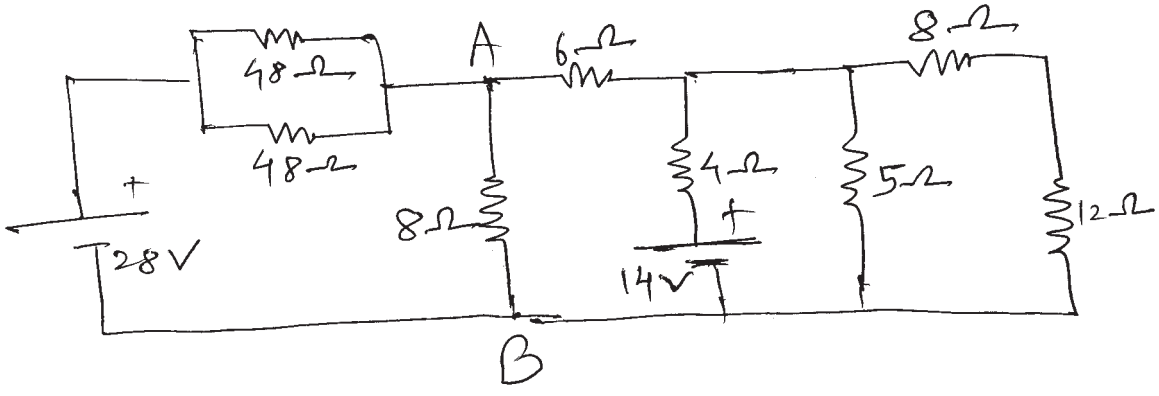

Fig. No. 3

d) State Thevenin's theorem. Draw Thevenin's equivalent circuit. State why Thevenin's theorem is convergent of Norton's theorem.

e) Find the Norton equivalent circuit for the active linear network as shown in Figure No. 4.

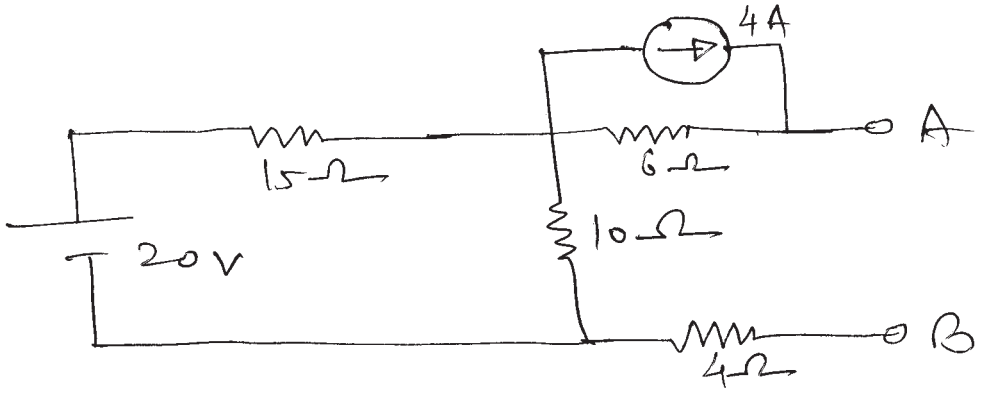

Fig. No. 4

Marks

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

a) A circuit consisting of a coil of resistance 12Ω and inductance 0.15 H in series with a capacitor of 12 μf is connected to a variable frequency supply which has a constant voltage of 24V, Calculate:

i) The resonant frequency

ii) The current at resonance

iii) The voltage across capacitor and the coil at resonance.

b) A coil of resistance 20Ω and inductance 200 μH is in parallel with a variable capacitor. (Refer Figure No. 5(b)) This combination is in series with a resistor of 8000Ω. The voltage of the supply is 200 V at a frequency of 10^6Hz as in Figure No. 5. Calculate:

i) The value of C to give resonance

ii) The Q of the coil

iii) The current in each branch of the circuit at resonance.

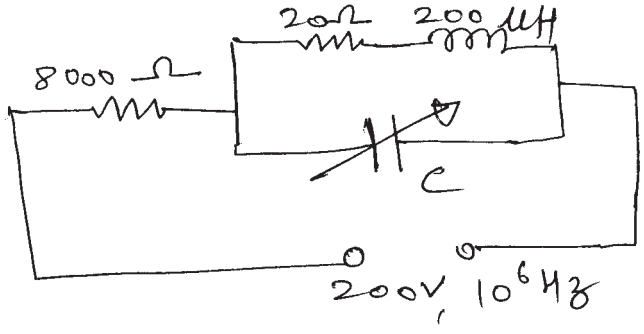

Fig. No. 5

c) For the circuit shown in Figure No. 6. Find the magnitude and direction of the current in the 2Ω resistor by using Thevenin's theorem.

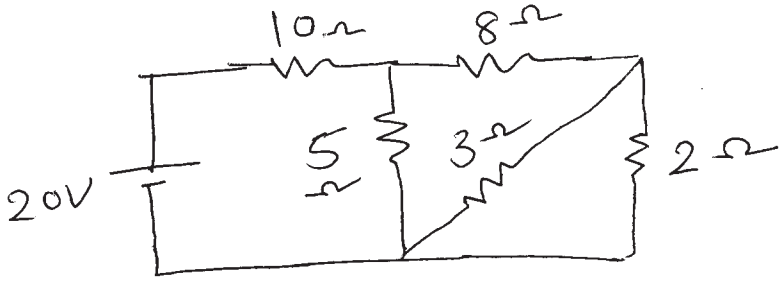

Fig. No. 6

P.T.O.

Marks

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

a) The load in each branch of a star-connected 3-ϕ circuit consists of an inductance of 0.0318 H in series with a resistance of 10 Ω. The line voltage is 400 V at 50 Hz.

Calculate:

i) The line current

ii) The total power in the circuit

iii) The VAR in the circuit.

b) Determine current in 5Ω resistance by using mesh analysis for the Figure No. 7.

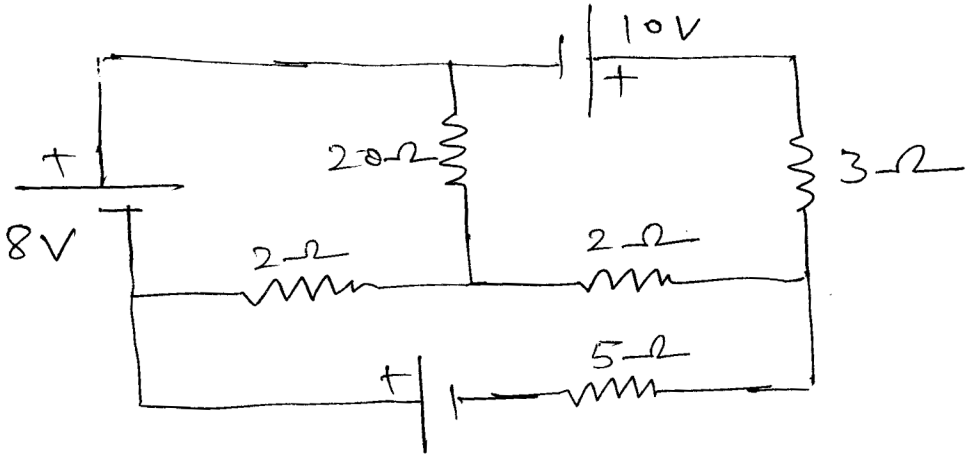

Fig. No. 7

c) State maximum power transfer theorem.

Prove that $P_{Lmax} = \frac{(V_{th})^2}{4R_L}$ in the circuit.