16117

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) 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. Solve any TEN of the following : **20**

(a) Write alternating voltage and current equations.

(b) Define : (i) Amplitude (ii) Cycle

(c) Define : (i) Impedance (ii) Inductive reactance

(d) Draw power triangle for R-L series circuit.

(e) Define with unit Admittance.

(f) Define Quality Factor. Give equation of it.

(g) Give emf equations for three phase a.c. circuit.

(h) Define line voltage and phase voltage.

(i) Give equations of Delta to Star transformations.

(j) State Maximum Power Transfer Theorem.

(k) State Norton's theorem.

(l) State the meaning of t = o –, & t = o +

2. Attempt any FOUR of the following : 16

(a) Define : (1) RMS value

(2) Average value

(b) Draw circuit diagram, phasor diagram, waveform of voltage & current for R-L series circuit.

(c) Give comparison of series and parallel circuit.

(d) Define : (1) Balanced load

(2) Unbalanced load

(e) State why source transformation is needed. Give three steps to convert voltage source into current source.

(f) Explain the concept of initial conditions in switching circuits for the element R, L & C.

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

(a) An a.c. series circuit has a resistance of 10 Ω, an inductance of 0.2 H and a capacitance of 60 μF. Calculate : (a) resonant frequency (b) current (c) power at resonance. Applied voltage is 200 V.

(b) Two impedances given by $Z_1 = (10 + j5)$ and $Z_2 = (8 + j6)$ are joined in parallel and connected across a voltage of $V = 200 + j0$. Calculate the circuit current, its phase and branch currents. Draw the vector diagram.

(c) Explain advantages of poly phase circuit over single phase circuit.

(d) Find the ammeter current in fig. (1) by using mesh analysis.

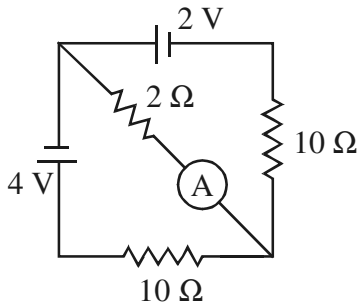

Figure (1)

(e) Find the Norton equivalent impedance for the active linear network shown in fig. (2).

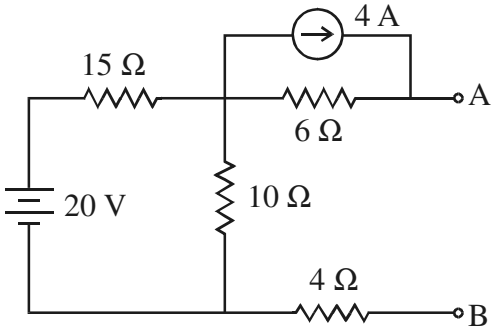

Figure (2)

(f) Explain concept of final condition in switching circuits for R, L and C element.

P.T.O.

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

(a) An alternating voltage given by e = 150 sin 100 πt is applied to a circuit which offers a resistance of 50 ohms. Find r.m.s. and average value of current and supply frequency.

(b) A 50 Hz voltage of 230 V effective value is impressed on an inductance of 0.265 H. (i) Write the time equation for the voltage and resulting current. Let the zero axis of the voltage wave be at t = 0. (ii) Show the voltage and current on a phasor diagram.

(c) A circuit consisting of a coil of resistance 12 Ω 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 240 V. Calculate : (a) resonant frequency (b) current in the circuit at resonance.

(d) A voltage of 200 / 53° is applied across two impedances in parallel. The values of impedances are (12 + j16) and (10 – j20). Determine the kVA, kVAR and kW in each branch and power factor of the whole circuit.

(e) Each phase of a delta-connected load comprises a resistor of 50 Ω and capacitor of 50 μF in series. Calculate the line and phase currents when the load is connected to a 440 V, 3 phase 50 Hz supply.

(f) Use Nodal analysis to determine the value of current i in the network of fig. (3).

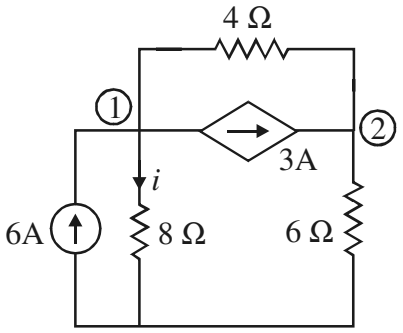

Figure (3)

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

(a) A pure inductance allows a current of 10 A to flow from a 230 V, 50 Hz supply. Find (i) Inductive reactance (ii) Inductance (iii) Power absorbed. Write down the equation for voltage & current.

(b) A two – element series circuit is connected across an ac source

$e = 200\sqrt{2} \sin (wt + 20°)$ V. The current in the circuit then is found to be

$i = 10\sqrt{2} \cos (314\ t - 25°)$ A. Determine the parameters of the circuit.

(c) Draw the vector dia. for the circuit shown in fig. (4) indicating the resistance and reactance drops, the terminal voltages V_1 and V_2 and current.

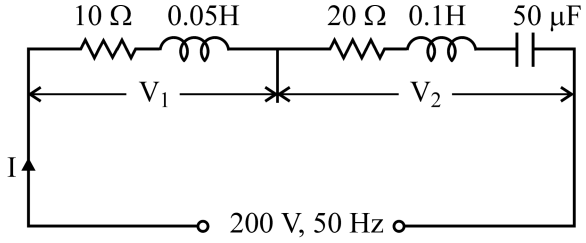

Figure (4)

(d) State relationship between line voltage and phase voltage, line current & phase current in a balanced delta connection. Draw complete phasor diagram of voltages & current.

(e) Calculate current-flowing through 2 Ω resistor in fig. (5) by using super position theorem.

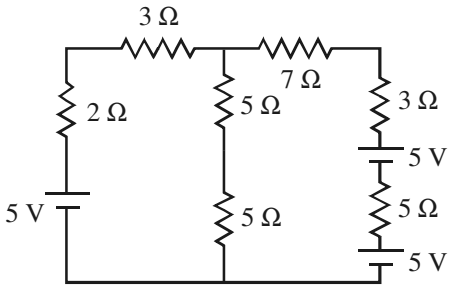

Figure (5)

P.T.O.

(f) Obtain the Thevenin equivalent circuits for the circuit shown in fig. (6).

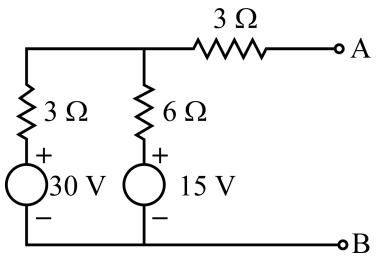

Figure (6)

6. Attempt any FOUR of the following : 16

(a) Draw the phasor diagram and waveform of pure inductance and pure capacitance. Write voltage and current equation of it.

(b) An ohmic resistance is connected in series with a coil across 230-V, 50 Hz supply. The current is 1.8 A and p.d. across the resistance and coil are 80 V & 170 V respectively. Calculate resistance & inductance of the coil.

(c) State the advantages of polyphase circuit over single phase circuit.

(d) Apply Norton's theorem to calculate current flowing through 5 Ω resistor of fig (7).

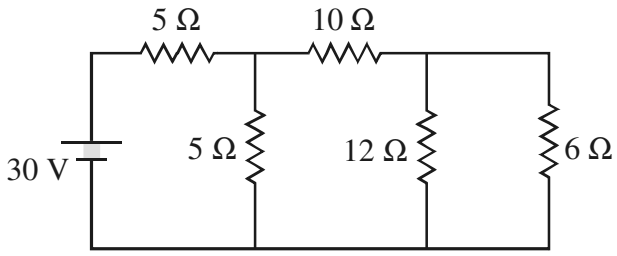

Figure (7)

(e) Calculate the value of R which will absorb maximum power from the circuit of fig. (8).

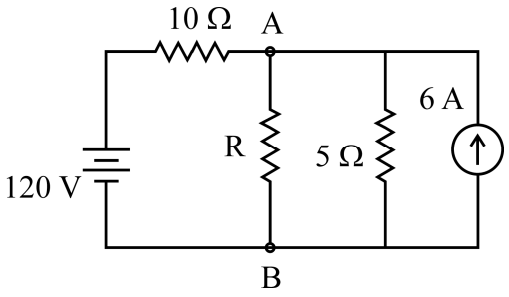

Figure (8)

(f) Use super-position theorem to find the voltage V in the network shown in fig. (9)

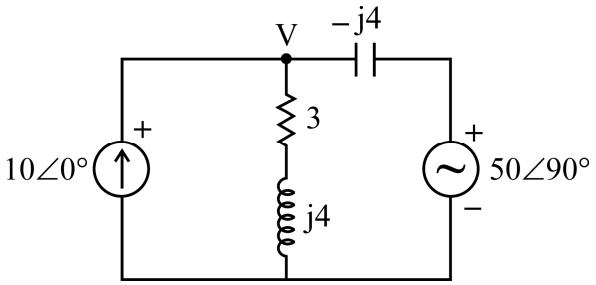

Figure (9)

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