

ELECTRICAL CIRCUITS
(Electrical and Electronics Engineering)

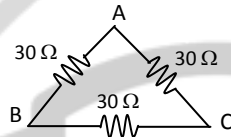
Time: 3 hours

Max. Marks: 70

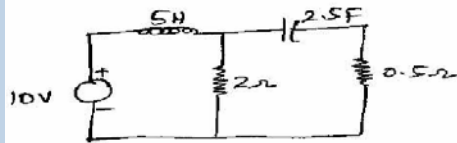
PART – A
(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

(a) Transform the circuit shown below to delta-star transformation:



- (b) Two inductively coupled coils have self inductances $L_1 = 50$ mH and $L_2 = 200$ mH. If the coefficient of coupling is 0.5, compute the value of mutual inductance between the coils.
- (c) Determine the power factor of a RLC series circuit $R = 5 \Omega$, $X_L = 8 \Omega$ and $X_C = 12 \Omega$.
- (d) In a three-phase balanced delta system, the voltage across R and Y is $400\angle 0^\circ$ V. What will be the voltage across Y and B? Assume RYB phase sequence.
- (e) When the circuit is said to be under resonance?
- (f) Draw the dual network for the circuit shown below:



- (g) State reciprocity theorem.
- (h) Write down general equations for hybrid parameters.
- (i) Define the term 'Time constant' of a circuit, in general.
- (j) Write the any two property of Fourier transform.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 (a) State and explain the Kirchoff's Laws.
- (b) A coil consists of 750 turns and a current of 10 A in the coil gives rise to a magnetic flux of $1200 \mu\text{Wb}$. Calculate the inductance of the coil and determine the average emf induced in the coil when the current is reversed in 0.1 sec.

OR

- 3 (a) State and explain Faraday's laws of electromagnetic induction.
- (b) The number of turns in a coil is 250. When a current of 2 A flows in the coil, the flux in the coil is 0.3 mWb . When the current is reduced to zero in 2 ms, the voltage induced in a coil lying in the vicinity of the coil is 63.75 V. If the co-efficient of coupling between the coils is 0.75, find: (i) The self inductance of the two coils. (ii) Mutual inductance. (iii) Number of turns in the second coil. (iv) Derive the formulae used.

UNIT – II

- 4 (a) Derive the relation between phase and line values in a 3-phase balanced star connected system with neat circuit diagram.
- (b) An unbalanced four wire, star connected load has a balanced voltage of 400 V, the loads are: $Z_1 = (4+j16) \Omega$, $Z_2 = (5+j20) \Omega$, $Z_3 = (8+j4) \Omega$. Calculate the: (i) The line currents. (ii) Current in the neutral wire and (iii) The total power.

OR

- 5 (a) Explain how power is measured in three phase star connected system using two wattmeter method with neat circuit diagram.
- (b) An unbalanced four wire, star connected load has a balanced voltage of 400 V, the load are; $Z_1 = (4+j8) \Omega$, $Z_2 = (15+j20) \Omega$, $Z_3 = (3+j4) \Omega$. Calculate the: (i) The line currents. (ii) Current in the neutral wire and (iii) The total power.

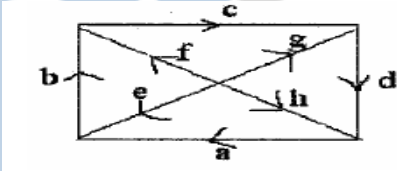
Contd. in page 2

UNIT – III

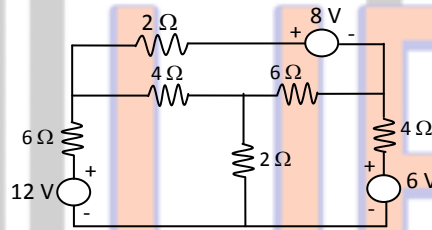
- 6 (a) Write short notes on nodal analysis. By taking any one example explain the significance of nodal analysis.
 (b) A capacitor C is in series with a 75Ω resistor and a 12 H coil across a 220 V , 60 Hz supply. Determine the value of ' C ' that resonates the circuit.

OR

- 7 (a) Write the tie-set schedule and write tie-set matrices also. Write the relationship between the branch current and link currents of the given figure below.

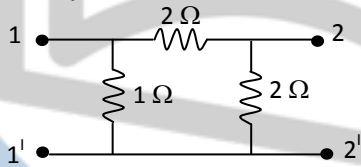


- (b) Find the cut-set matrix of the network as shown in figure and obtain relationship between the branch current and voltages.



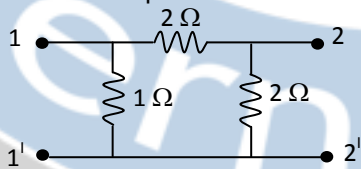
UNIT – IV

- 8 (a) State and explain the maximum power transform theorem.
 (b) Find the transmission parameters for the resistance network shown in figure below.



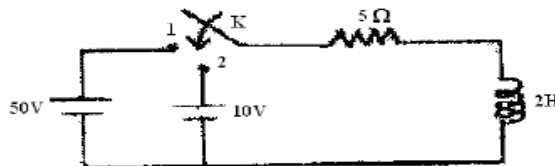
OR

- 9 (a) State Millmann's theorem and Tellegon's Theorem.
 (b) Find the Z and transmission parameters for the resistance network shown in figure below.



UNIT – V

- 10 In the circuit shown in figure, the switch S is in position 1 for a long time and brought the position 2 at time $t=0$. Determine circuit current.



OR

- 11 (a) A series RLC circuit has $R = 50 \Omega$, $L = 0.2 \text{ H}$ and $C = 50 \mu\text{F}$ constant voltage of 100 V is impressed upon the circuit at $t = 0$. Find the expression for the transient current assuming initially relaxed conditions.
 (b) Explain the properties of Fourier transforms in detail.
