Code: 13A02101

SS

B.Tech II Year I Semester (R13) Regular & Supplementary Examinations December 2015

ELECTRICAL CIRCUITS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) The current in a 15 mH inductor is $i_L = (2 - e^{-1000t})$ mA. What is the voltage across inductor?
(b) Define reluctance and magnetic flux.
(c) Define power factor. What is its significance?
(d) Write any four advantages of three phase (3-Φ) system.
(e) What are the properties of resonance of RLC series circuit?
(f) What is meant by oriented graph?
(g) State reciprocity theorem.
(h) Define two port network.
(i) State initial and final value theorems.
(j) Define even symmetry and odd symmetry.

PART – B

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

UNIT – I

2 (a) If R_1, R_2 and R_3 are connected in star and R_{12}, R_{23} and R_{31} are connected in delta, obtain the expressions for star-delta and delta-star equivalence of resistive network.
(b) Two 100 W, 220 V bulbs are required to be connected across a 400 V supply. Find the value of the resistance to be inserted in the line so that the voltage across the bulbs does not exceed 220 V.

OR

3 (a) Derive the relation between self inductance, mutual inductance and coefficient of coupling.
(b) Two coupled coils have K = 0.8, N_1 = 500 turns, N_2 = 1000 turns and the mutual flux being 0.9 Wb, find the primary coil flux. If the primary current be 10 A, find the primary coil inductance. Also obtain the secondary inductance.

UNIT – II

4 (a) Define and derive the expressions for a sinusoidal wave excited by an AC source: (i) Average value. (ii) RMS value. (iii) Form factor.
(b) 100 V, 50 Hz is applied across a series RLC circuit having R = 10 Ω, L = 100 mH and C = 1000 μF. Find the current and drop across each element.

OR

5 (a) Derive the relationship between phase and line values in a three phase balanced star connected system.
(b) The power readings of two watt meters are +15 kW and -4 kW for a three phase load. If the supply voltage is balanced 440 V, find the true power drawn by the load, the power factor and line current.

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UNIT – III

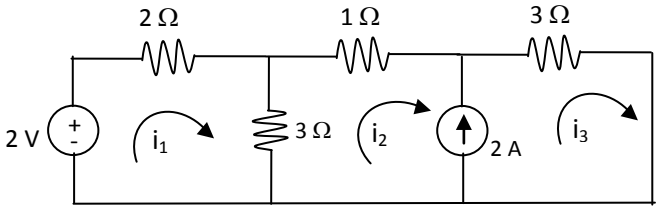
6 (a) Derive the relation between bandwidth, resonant frequency and Q-factor of a series circuit.

(b) The Q-factor of a RLC circuit is 5 at its resonance frequency of 1 kHz. Assuming the power dissipation of 250 W, when the current drawn is 1 A, find the circuit parameters. Determine the BW of the circuit.

OR

7 (a) Explain the principle of duality and construction of a dual network.

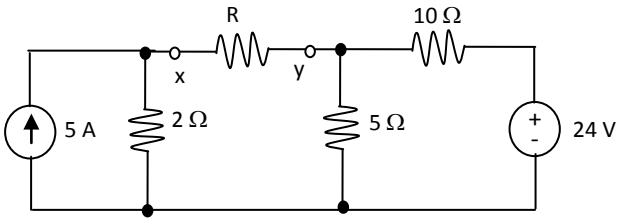
(b) Calculate the mesh currents in the network shown in figure below.



UNIT – IV

8 (a) Show that the efficiency is 50% during maximum power transfer condition.

(b) What would be the value of R such that maximum power transfer can take place from the rest of the network to R in figure given below? Obtain the amount of this power.



OR

9 (a) Prove that the overall ABCD parameters in matrix for cascade connected of two-port is the matrix products of ABCD parameters for each individual two-port network.

(b) Following short circuit currents and voltages are obtained experimentally for a two-port network:
(i) With output short-circuited, I_1 = 5 mA ; I_2 = -0.3 mA ; V_1 = 25 V.
(ii) With input short-circuited , I_1 = -5 mA ; I_2 = 10 mA ; V_2 = 30 V.
Determine Y – parameters.

UNIT – V

10 (a) Explain the properties of Fourier transform.

(b) Explain line spectra and phase angle spectra of Fourier series.

OR

11 (a) Derive the expression for current of RL series circuit excited with the DC supply.

(b) In a series R-L-C circuit, R = 5 Ω, L = 1 H and C = 1 F. A d.c voltage of 20 V is applied at t = 0. Obtain i(t).

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