B.Tech I Year (R13) Regular Examinations June/July 2014

NETWORK ANALYSIS

(Common to ECE & EIE)

Time: 3 hours Max. Marks: 70

Part – A
(Compulsory Question)

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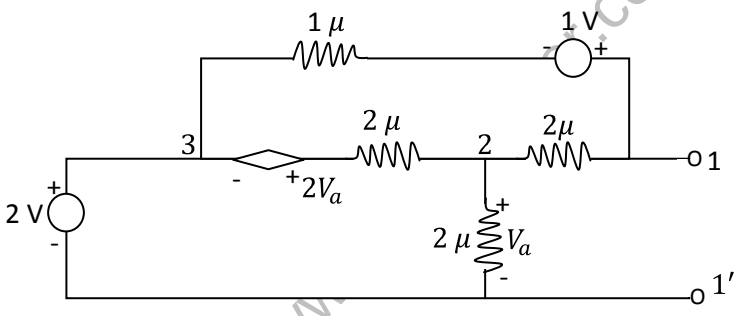
Answer the following: (10 X 02 = 20 Marks)

1 (a) A network has 7 nodes and 5 independent loops. The number of branches in the network is_____.
(b) The nodal method of circuit analysis is based on _____.
(c) For a series R-C circuit excited by a d-c voltage of 10 V, and with time-constant τ s the voltage across C at time t = τ is given by _____.
(d) The Q factor for an inductor L in series with a resistance R is given by_____.
(e) The Q factor of a parallel resonance circuit consisting of an inductance of value 1 mH, capacitance of value 10^{-5}F and a resistance of 100 ohms is _____.
(f) Power in 5 Ω resistors is 20 W. The resistance R is_____.
(g) A 2-port network using z-parameter representation is said to be reciprocal if_____.
(h) Two inductors of value L_1 and L_2 are coupled by a mutual inductance M. By inter connection of the two elements, one can obtain a maximum inductance of_____.
(i) A n-section filter comprises a series arm inductance of 20 mH & two shunt capacitors each of 0.16 micro farad. Calculate the attenuation at 15 KHz.
(j) A second order band pass filter has a value of 10 for the ratio of center frequency to bandwidth. The filter can be realized with _____.

Part – B
(Answer all five units, 05 X 10 = 50 Marks)

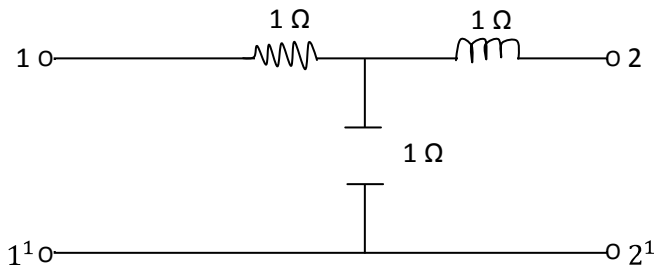
UNIT - I

2 (a) Explain the terms:
(i) Incidence matrix.
(ii) Basic cutset.
(b) Obtain the Norton's equivalent at the terminals 1, 1′ of the network shown in figure given below.



OR

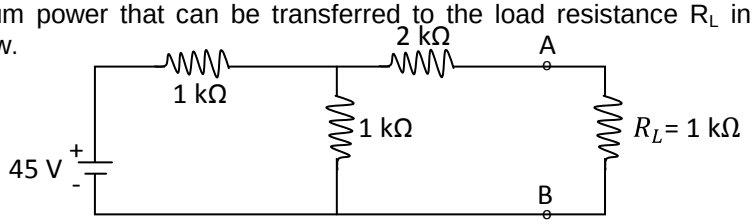
3 (a) Explain the terms:
(i) Basic tie set.
(ii) Node & mesh.
(b) State and explain the reciprocity theorem and verify the network shown in figure given below is reciprocal or not.



Contd. in page 2

4 (a) Obtain the expression for frequency at which the voltage across the inductance becomes a maximum in a series RLC circuit. Explain what is meant by voltage magnification factor.

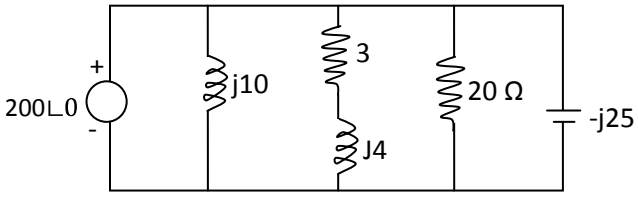
(b) Find the maximum power that can be transferred to the load resistance R_L in the circuit shown in figure given below.



OR

5 (a) Find the expression for current of a series R-L-C circuit fed by constant DC voltage of 20 V with R = 4 Ω, L = 1 H and C = ¼ F. Assume initial conditions to be zero.

(b) Obtain the total current, branch currents and the power consumed by each branch. Draw the phasor diagram for the network shown in figure given below.



UNIT-III

6 (a) Define resonance, anti resonance, quality factor. Deduce the resonant frequency of parallel RLC circuit.

(b) Compare series resonance and parallel resonance circuits. An RLC circuit consists of R = 1 kΩ, L = 100 mH, C = 10 μF. If a voltage of 100 V is applied across the combination, determine resonant frequency, Q factor and bandwidth.

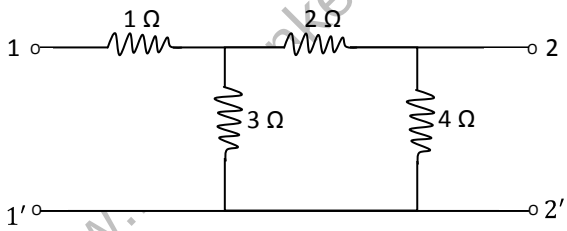
OR

7 (a) Deuce the relation between bandwidth and resonant frequency.

(b) An inductance of 0.5 H a resistance of 5 Ω and a capacitance of 8 μF are in series across a 220 V AC supply. Calculate the frequency at which the circuit resonates. Find the current at resonance bandwidth, half power frequencies and the voltage across capacitance of resonance.

UNIT - IV

8 (a) Obtain the hybrid parameters of the following 2-port network figure given below.

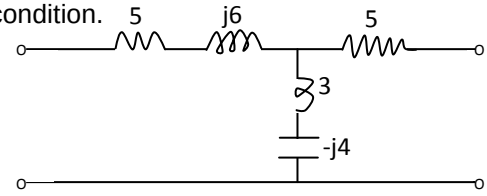


(b) Derive the relation between Y and h parameters.

OR

9 (a) Design a high pass filter with a cut-off frequency of 1 KHz with a terminated design impedance of 800 Ω.

(b) Obtain the transmission parameters for the following circuit figure given below. Verify your result for reciprocity condition.



UNIT - V

10 (a) What is the different between constant –k and m-derived filters?

(b) Design an m-derived π section high pass filter with a cut-off frequency of 10 KHz, R_k = 600 Ω and infinite attenuation frequency of 8 KHz.

OR

11 (a) Explain what is meant by constant k-filters. Classify them.

(b) Design an m-derived T section low pass filter having a design impedance of 600 Ω, cut-off frequency of 2,400 Hz and infinite attenuation at 2,500 Hz.

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