

B.Tech I Year (R13) Supplementary Examinations December/January 2014/2015

NETWORK ANALYSIS

(Common to ECE and EIE)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

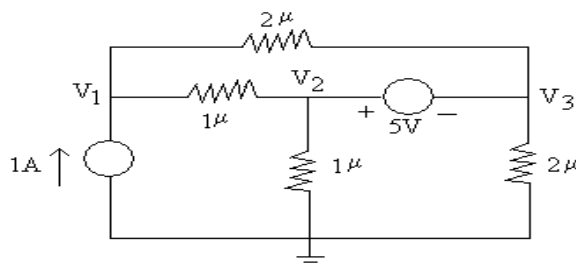
- 1 Answer the following: (10 X 02 = 20 Marks)
- For a network of seven branches and four nodes, the number of independent loops will be ----
 - The number of independent loops for a network with n nodes and b branches are-----
 - In a series RLC circuit with output taken across C , the poles of the transfer function are located at $-\alpha \pm j\beta$. The frequency of maximum response is given by -----
 - The free response of RL and RC series networks having a time constant τ is of the form-----
 - The natural response of a network is of the form $(A_1 + A_2 t + A_3 t^2) e^{-t}$. The network must have repeated poles at $s = 1$ with multiplicity -----
 - The mutual inductance M associated with the two coupled inductances L_1 and L_2 and is related to the coefficient of coupling K is -----
 - A 2 port network using Z parameter representation is said to be reciprocal if -----
 - Two inductors of values 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 -----
 - A π – section filter comprises a series arm inductance of 20 mH & two shunt capacitors each of 0.16 microfarad. Calculate the attenuation at 15 KHz.
 - 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, 5 X 10 = 50 Marks)

UNIT – I

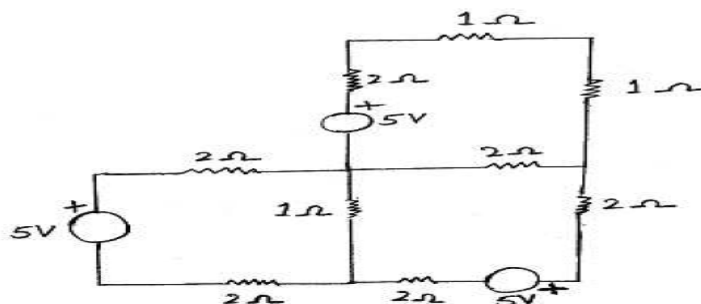
- 2 (a) Find the node voltage V_1 , V_2 , and V_3 for the circuit given figure below.



- (b) State and explain Tellegen's theorem

OR

- 3 (a) Using KCL and KVL, find the currents in all the sources of the circuit of the following figure.



- (b) Explain Miller's theorem with an example.

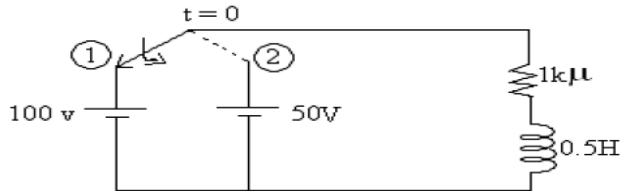
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UNIT – II

- 4 (a) Define circuit transient, time constant, natural response and forced response.
 (b) An exponential voltage $V(t) = e^{-t}$ is suddenly applied at $t = 0$ to a series RC circuit with $R = 9 \Omega$, $C = 0.25F$. Obtain particular solution for current $i(t)$ through the circuit if the initial charge across the capacitor C is zero.

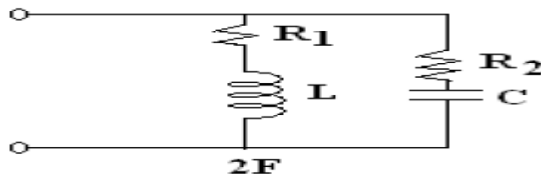
OR

- 5 (a) Deduce the transient response of RL series circuit excited by DC source.
 (b) In the series RL circuit the switch is closed on position (1) at $t=0$, and then at $t = t' = 50 \mu$ sec, it is moved to position (2) Find the expression for current in the intervals $0 < t < t'$ and $t < t'$. Shown in figure below.



UNIT – III

- 6 (a) Obtain the expression for resonance frequency of a parallel resonant circuit shown in the figure below. Find the condition for resonance at all frequencies.



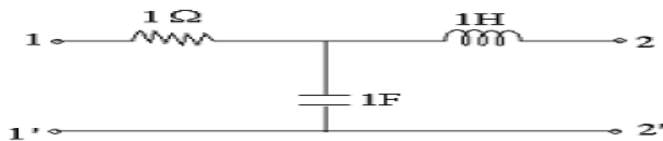
- (b) Define self-inductance of a coil, mutual inductance between two coils and coefficient of coupling. Derive the relation between the self, mutual inductances and coefficient of coupling.

OR

- 7 (a) A RLC series circuit of 8Ω resistance should be designed to have a bandwidth of 50 Hz. Determine the values of L and C so that the system resonates at 250 Hz.
 (b) Distinguish between reactance, impedance, admittance and susceptance

UNIT – IV

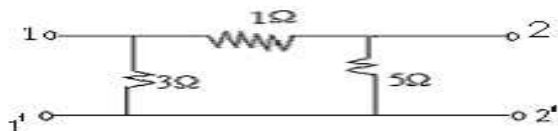
- 8 (a) Obtain the transmission parameters of the 2-port network shown in figure below.



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

OR

- 9 (a) For the following network, obtain the impedance parameters and hence determine transmission parameters.



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

UNIT – V

- 10 (a) What is the difference between constant – k and m -derived filters?
 (b) Design a high pass π network, having a cut-off frequency of 3250 Hz. The frequency of infinite attenuation may be taken as 2750 Hz. The characteristic impedance is 450μ .

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 600Ω , cut-off frequency of 2400 Hz and infinite attenuation at 2500 Hz.
