## **EE 301 – Electric Circuit Theory**

## **Multiple Choice Type Questions**

- i) Inverse Laplace transform of 1/(s + a) is
   a) sin (at)
   c) e<sup>at</sup>
  - b) cos (at) d) none of these
  - ii) A series R-L-C circuit under resonance condition is called
  - a) is always 50 % c) is infinity
  - b) depends on the circuit parameters d) is 100 %

iii) Thevenin's theorem is not applicable for circuits with

a)	passive load	c) bilateral load
b)	active load	d) none of these

iv) The voltages  $\mathsf{V}_1$  and  $\mathsf{V}_2$  in the given circuit are

a)	6V, 4V	c) 5V each
b)	4V, 6V	d) none of these

0	V,	V2
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v) The number of links for a graph having n nodes and b branches is

- a) b n + 1 c) b + n 1
- b) n b + 1 d) b + n

vi) A two-port network is reciprocal if and only if

a)	$Z_{11} = Z_{22}$	c) Y <sub>12</sub> = Y <sub>21</sub>
b)	BC – AD = - 1	d) $h_{12} = h_{21}$

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viii) The equation Y = mx + c is
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a)	linear	c) parabolic
b)	non-linear	d) none of these

viii) The value of the unity impulse function  $\delta$  (t) at t = 0 is

a) 0 c) 1 b) ∞ d) indeterminate

ix) A cut set schedule gives relation between

- a) branch currents & link currents
- b) branch voltages & tree branch voltages
- c) branch voltages & link voltages
- d) branch currents & tree currents
- x) Two networks can be dual when
- a) their nodal equations are the same
- b) the loop equations of one network are the nodal equations of the other
- c) their loop equations are the same
- d) none of these

## **Short Answer Type Questions**

- 2. Define tie-set. With the help of a suitable example, explain the term 'tie-set matrix' used in network analysis.
- 3. Find the Norton's equivalent circuit across the terminal AB of the circuit shown in figure below:



- 4. What are ABCD parameters? Prove that AD BC = 1.
- 5. For the graph shown in figure below, find the complete incidence matrix.



- 6. Determine for a two-port network the condition of reciprocity & condition of symmetry in terms of h-parameters.
- 7. Obtain the output voltage  $V_0$  across X Y terminal for the circuit shown in figure –



## **Long Answer Type Questions**

8. a) Find the Fourier transform of an exponential voltage waveform given by  $v(t) = V_0 e^{-t}$  for  $t \ge 0$ = 0 for t < 0

b) Define Fourier transform of an aperiodic function f (t). Obtain the Fourier transform of a single pulse of magnitude V and duration  $\tau$ . Show that as f(t) changes from periodic to aperidodic, the amplitude spectrum changes from a line spectrum to a continuous spectrum, keeping their envelops of the same shape.

9. a) Find the Laplace transform of the waveform shown:



b) Define convolution theorem.

c) Draw the graph corresponding to the given incidence matrix:

	- 1	0	0	0	+ 1	0	+ 1	0	1
	0	- 1	0	0	0	0	- 1	+ 1	
A =	0	0	- 1	- 1	0	- 1	0	- 1	
	0	0	0	0	- 1	+ 1	0	0	
	- 1	+ 1	+ 1	+ 1	0	0	0	0	

10. a) 4 wires are joined at a node. The current entering this node through 3 of them are 5 cos ωt, 6 sin ( ωt+π/6) and 2 cos ( ωt+π/3). Using the phasor method determine the current leaving this junction through the 4 wire.
b) In a linear ciercuit consisting of R = 9Ω & L = 8 mH, a current i = 5 + 100 sin ( 1000t + 45°) + 100 sin ( 3000 + 60°) amps is flowing. Find the equation of

applied voltage.

11. a) Find Z-parameters of the network shown below. Hence find the ABCD parameters for the same network.



b) State and explain Millman's theorem. Calculate the load current I in the circuit in figure below by Millman's theorem.



c) What are transmission parameters? Where are they most effectively used?

12. a) Differentiate between active and passive filters.

b) Find out the cut-off frequency of the following low-pass second order active filter shown below –



c) Draw the circuit diagram of a first order high-pass active filter and find out the expression of the cut-off frequency.