University Institute of Engineering & Technology
(A Constituent Autonomous Institute)
Kurukshetra University, Kurukshetra
THEORY EXAMINATION – DECEMBER 2015

ROLL NO.....B. Tech (Electronics & Comm Engg) 3rd Semester
COURSE NO.: ECE-205 COURSE TITLE: Network Analysis & Synthesis
M.M. 75 TIME 3 HRS

PART-A (TIME 30 MINUTES)

1. Answer the following multiple choice questions 15

1. If v_s changes from 2 V to 4 V at $t = 0$, we may express v_s as:
   (a) $\delta(t)$ V (b) $2u(t)$ V
   (c) $2u(-t) + 4u(t)$ V (d) $4u(t) - 2$ V

2. If the roots of the characteristic equation of an RLC circuit are -2 and -3, the response is:
   (a) $(A\cos 2t + B\sin 2t)e^{-3t}$
   (b) $(A + 2Bt)e^{-3t}$
   (c) $Ae^{-2t} + Bte^{-3t}$
   (d) $Ae^{-2t} + Be^{-3t}$
   where A and B are constants.

3. In a series RLC circuit, setting $R = 0$ will produce:
   (a) an overdamped response
   (b) a critically damped response
   (c) an underdamped response
   (d) an undamped response

4. In an electric circuit, the dual of resistance is:
   (a) conductance (b) inductance
   (c) capacitance (d) open circuit

5. The voltage through a resistor with current $i(t)$ in the s-domain is $sRI(s)$.
   (a) True (b) False

6. If the input to a linear system is $\delta(t)$ and the output is $e^{-2t}u(t)$, the transfer function of the system is:
   (a) $\frac{1}{s+2}$ (b) $\frac{1}{s-2}$ (c) $\frac{s}{s+2}$ (d) $\frac{s}{s-2}$

7. The impedance of a 10-F capacitor is:
   (a) $10/s$ (b) $s/10$ (c) $1/10s$ (d) $10s$

8. When port 1 of a two-port circuit is short-circuited, $\mathbf{I}_1 = 4\mathbf{I}_2$ and $\mathbf{V}_2 = 0.25\mathbf{I}_2$. Which of the following is true?
   (a) $y_{11} = 4$ (b) $y_{12} = 16$
   (c) $y_{21} = 16$ (d) $y_{22} = 0.25$

9. A two-port is described by the following equations:
   $$\mathbf{V}_1 = 50\mathbf{I}_1 + 10\mathbf{I}_2$$
   $$\mathbf{V}_2 = 30\mathbf{I}_1 + 20\mathbf{I}_2$$
   Which of the following is *not* true?
   (a) $z_{12} = 10$ (b) $y_{12} = -0.0143$

10 If a two-port is reciprocal, which of the following is *not* true?

(a) $z_{21} = z_{12}$ (b) $y_{21} = y_{12}$

(c) $h_{21} = h_{12}$ (d) $AD = BC + 1$

11 For the single-element two-port network in Fig. 1, z_{11} is:

(a) 0 (b) 5 (c) 10

(d) 20

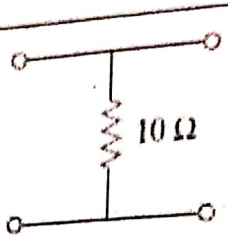

Fig. 1

12 For the single-element two-port network in Fig. 2, h_{21} is:

(a) 0 (b) -1 (c) 10

(d) 20

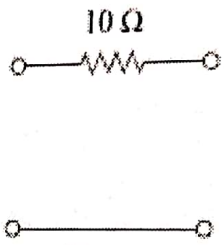

Fig. 2

13 A zero of the transfer function

$$H(s) = \frac{10(s+1)}{(s+2)(s+3)}$$

is at

(a) 10 (b) −1 (c) −2 (d) −3

14 $Z(s) = 10\dfrac{(s^2+4)(s^2+16)}{s(s^2+9)}$ is a valid driving point impedance of an LC network.

(a) True (b) False

15 For a constant K-high pass filter, having f_c=4KHz and design impedance Ro=600Ω (Π-section), the series arm capacitance (C) and shunt arm inductance (L) are given as

(a) C= 0.033μF , L= 11.937mH

(b) C= 11.937μF , L= 11.937mH

(c) C= 0.033μF , L= 0.033mH

(d) C= 11.937μF , L= 0.033mH

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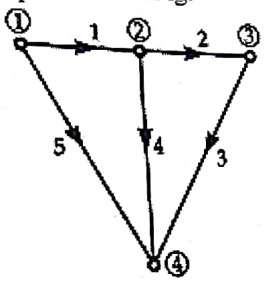
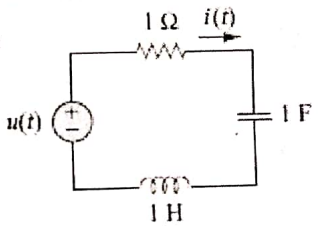
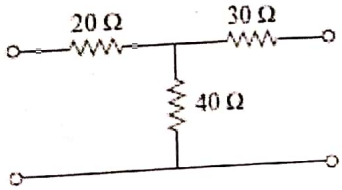
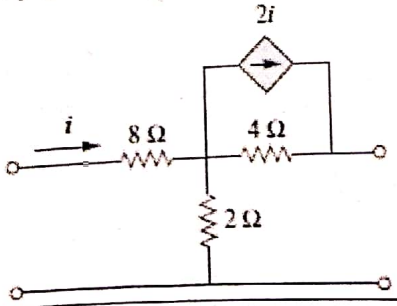
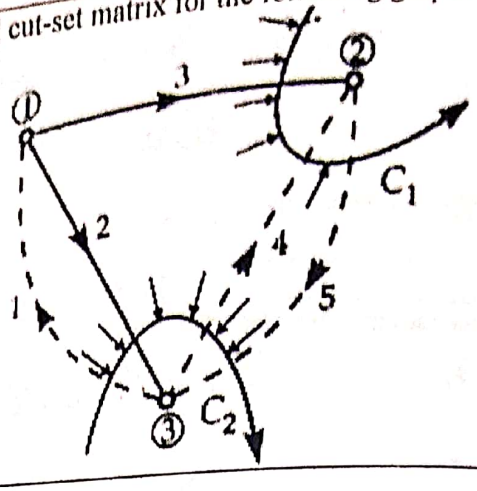
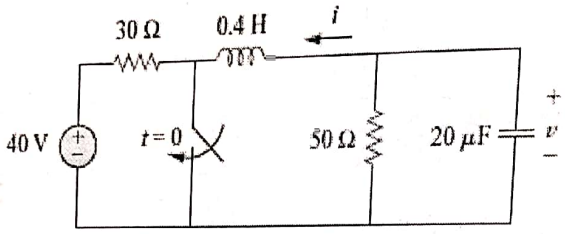
PART B &C (TIME 2H 30 MIN)

PART-B

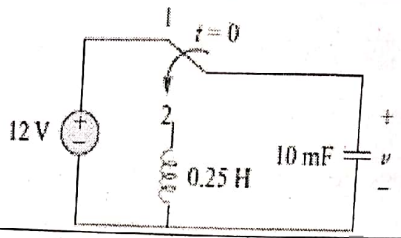
SECTION-I : All compulsory 2 question from each Unit		**20**
	UNIT-I	
2	Obtain the incidence matrix of the graph shown in Fig. 	2.5
3	Derive and explain the step response of RC circuit.	2.5
	UNIT-II	
4	Determine $i(t)$ in the circuit of Fig. by means of the Laplace transform. 	2.5
5	Discuss the concept of poles and zeros of network functions.	2.5
	UNIT-III	
6	Determine the z parameters for the circuit in Fig. 	2.5
7	Determine the y parameters for the two-port shown in Fig. 	2.5
	UNIT-IV	
8	Explain the concept of Hurwitz Polynomials.	2.5
9	Explain the concept of causality & stability in network synthesis.	2.5

SECTION-II : Attempt Four Questions in all Selecting at least One question from each Unit

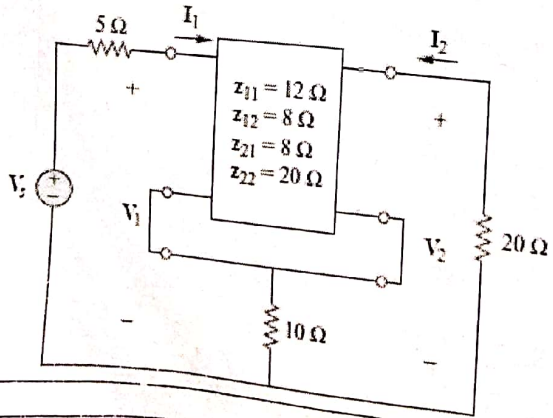
UNIT-I

10	Develop the fundamental cut-set matrix for the following graph. 	10
11	Find $v(t)$ for $t > 0$ in the RLC circuit of Fig. 	10

UNIT-II

12	The switch in Fig. moves from position 1 to position 2 at $t = 0$. Find $v(t)$, for all $t > 0$. 	10
13	Explain the various restrictions on pole and zero Locations for driving point functions.	10

UNIT-III

14	Determine [y] and [T] of a two-port network whose z parameters are $$[z] = \begin{bmatrix} 6 & 4 \\ 4 & 6 \end{bmatrix} \Omega$$	10
15	Evaluate V_2/V_s in the circuit in Fig. 	10

UNIT-IV

16	Design a Low Pass Filter to have a cut-off at 796 Hz when terminated In a 600Ω resistance, in both the T and Π configurations.	10
17	Define and explain positive real functions with its various properties.	10