(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 121410 Roll No. | | | | | | | | | |

B.TECH.

Theory Examination (Semester-IV) 2015-16

NETWORK ANALYSIS AND SYNTHESIS

Time : 3 Hours *Max. Marks : 100*

Section-A

Q1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

(a) Write the relation between Twigs and Links.

(b) List out the properties of a Tree in a Graph.

(c) State tellegen's theorem.

(d) What is the condition for maximum power transfer in an network? Also mention any two applications of maximum power transfer theorem.

(e) Write the time contants of RC and RL networks.

(f) An admittance is given by $Y(s)=\frac{1}{s+2}$. find the Pole-zero plot.

(g) Define transfer admittance and impedance of two port network.

(h) Write the Z-parameters in terms of ABCD parameters.

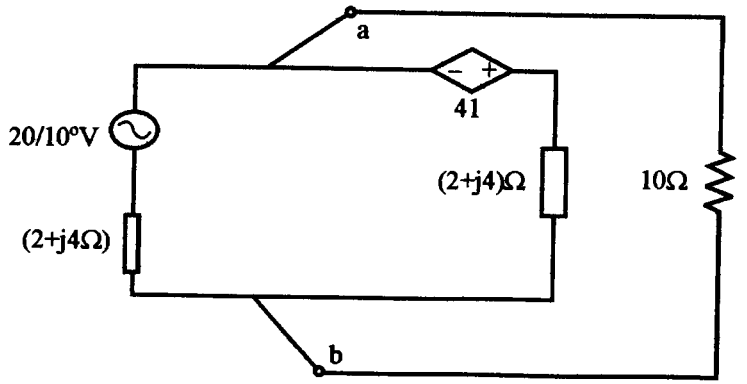
(i) Draw the reactance frequency characteristics of low pass filter.

(j) List-out the characteristics of filter.

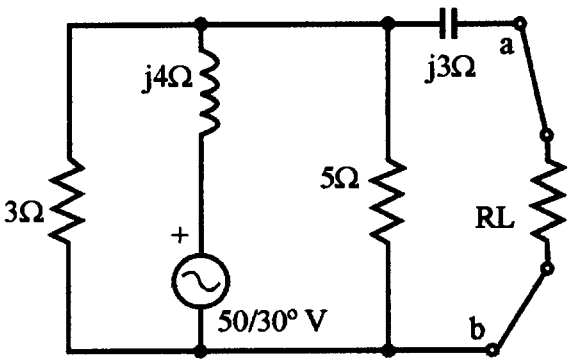
Section-B

Q2. Attempt any five question from this section. (10×2=30)

(a) Find Thevenin's equivalent circuit across a-b and find current through 10Ω resistor.



(b) What should be the value of R_L so the maximum power can be transferred from the source to R_L for the given figure.



(c) The reduced incidence matrix is

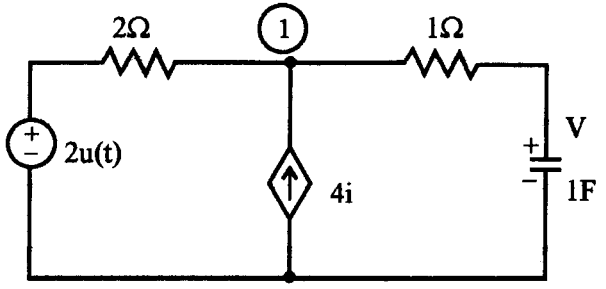
$$A=\begin{bmatrix} 1 & 0 & 0 & 0 & -1 \\ -1 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \end{bmatrix}$$. Do the following.

(i) Draw the graph

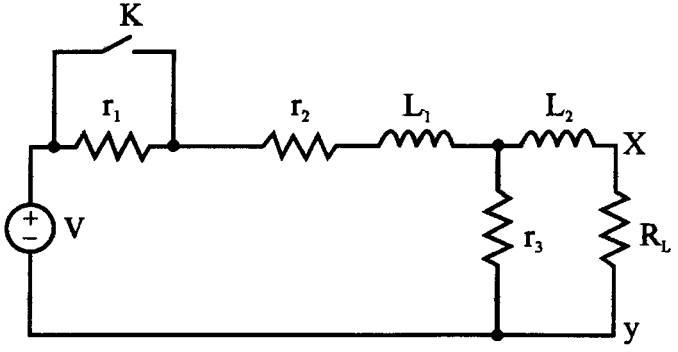
(ii) How many trees are possible and

(iii) Write Tiest and Cutset matrix

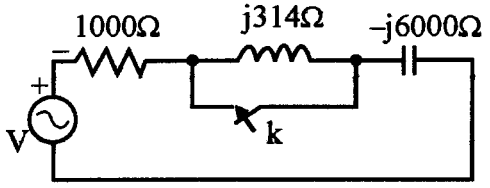
(d) In figure the initial voltage in the capacitor is 1V with the polarity as shown, find the voltage appearing across the capacitor using Laplace method with application of step voltage 3.



(e) A network has been shown in figure, the switch K is closed at t=0. Find the current in R_L using. The venins theorem. Assume steady state condition before switching. Use the following values :($r_1 = r_2 = r_3 = 10\Omega$; $L_1 = L_2 = 1H$; V=10V)



(f) In figure with switch open, steady state is reached with v=100sin314t volts. The switch is closed at t=0. The circuit is allowed to come to steady state again. Determine the steady state current and complete solution of transient current.



(g) On short circuit test, the currents and voltages were determined experimentally for an unknown two port network as

at $V_2=0$	at $V_1=0$
$I_1 = 1$ mA; $I_2 =$ –0.5 mA; $V_1 = 25V$	$I_1 = -1$ mA; $I_2 =$ –10 mA; $V_2 = 50V$

Determine the Y-parameters and draw the Y-parameter model.

(h) Synthesize the following network function in cuer-2 form:

$$Z(s) = \frac{8s^3 + 10s}{5 + 6s^3 + s^4}$$

Section-C

Note: Attempt any two questions from this section.

(15×2=30)

Q3. (a) The currents I_1 and I_2 at input and output port respectively of a two-port network can be expressed as: $I_1 = 5V_1 - V_2$; $I_2 = V_1 + V_2$

(i) Find the equivalent π-network.

(ii) Find the input impedance when a load of (3+j5)Ω is connected across the output port.

(b) A network has two input terminals a, b and output terminals c,d. The input impedance with c-d open circuited is (250+j 100)Ω and with c-d short cireuited is (400+j3000)Ω. The impedance acrosss c-d with a-b open circuited is 200Ω. Determine equivalent T network parameters.

Q4. Find the first order and second order Foster form of the driving point impedance function

$$Z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+4)}$$

Q5. Design a constant k-low pass filter having cut-off frequency 2.5kHz and desgn resistance $R_0 = 700\Omega$. Also find the frequency at which this filter produces attenuation of 19.1 dB. Find its characteristic impedances and phases constant at pass band and stop or attenuation band.