

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

Paper ID : 121410

Roll No.

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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 a network? Also mention any two applications of maximum power transfer theorem.
- (e) Write the time constants of RC and RL networks.

(1)

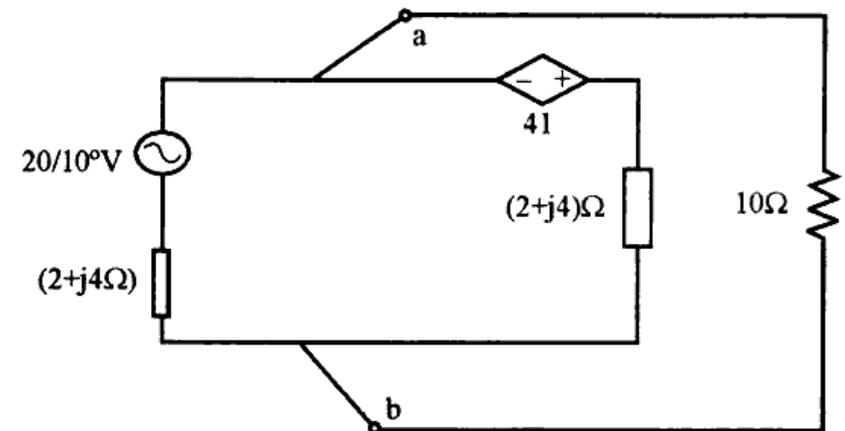
P.T.O.

- (f) An admittance is given by $Y(s) = \frac{1}{s+2}$. Find the Pole-zero plot.
- (g) Define transfer admittance and impedance of a two-port network.
- (h) Write the Z-parameters in terms of ABCD parameters.
- (i) Draw the reactance frequency characteristics of a low-pass filter.
- (j) List out the characteristics of a filter.

Section-B

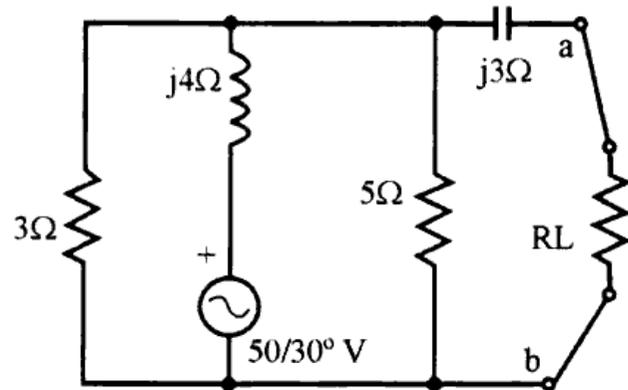
Q2. Attempt any five questions from this section. (10×2=30)

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



(2)

- (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

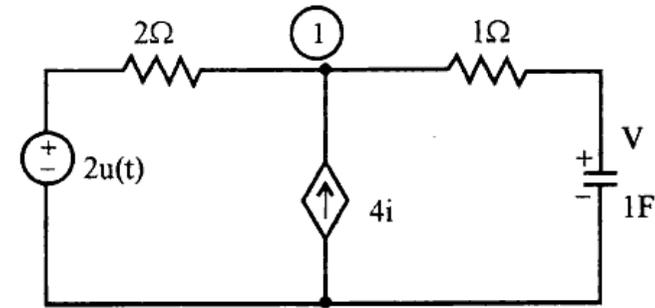
$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & -1 \\ -1 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \end{bmatrix}. \text{ Do the following.}$$

- (i) Draw the graph
- (ii) How many trees are possible and
- (iii) Write Tiest and Cutset matrix

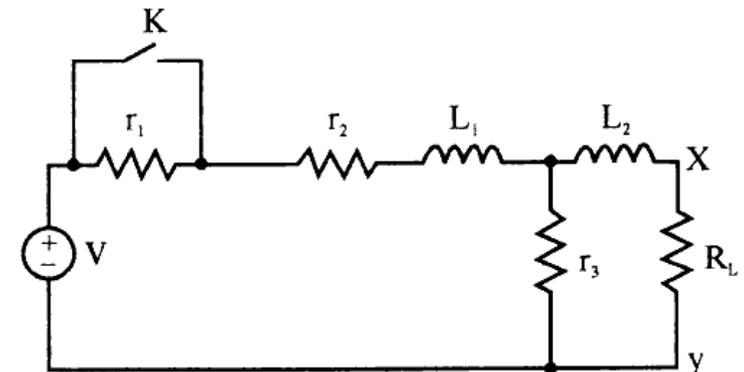
(3)

P.T.O.

- (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 $:(r_1 = r_2 = r_3 = 10\Omega; L_1 = L_2 = 1H; V=10V)$



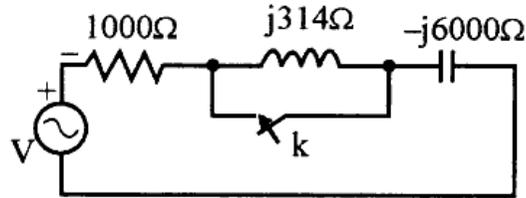
(4)

Section-C

Note: Attempt any two questions from this section.

(15×2=30)

- (f) In figure with switch open, steady state is reached with $v=100\sin 314t$ 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 $V_1=0$
$I_1 = 1 \text{ mA}; I_2 = -0.5 \text{ mA}; V_1 = 25\text{V}$	$I_1 = -1 \text{ mA}; I_2 = -10 \text{ mA}; V_2 = 50\text{V}$

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

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

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

(5)

P.T.O.

- 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 $(3+j5)\Omega$ 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 $(250+j 100)\Omega$ and with c-d short circuited is $(400+j3000)\Omega$. The impedance across 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

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

(6)

- Q5. Design a constant k-low pass filter having cut-off frequency 2.5kHz and design 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.