

(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)**

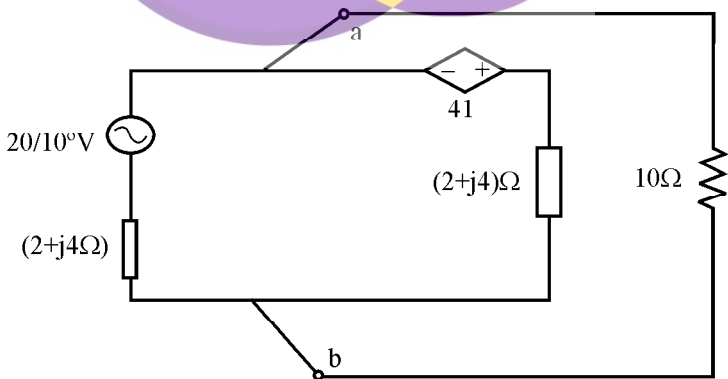
- (a) Write the relation between Twigs and Links.
- (b) List out the properties of a Tree in a Graph.
- (c) State tellegen's theorem.
- (d) What is the condition for maximum power transfer in an network? Also mention any two applications of maximum power transfer theorem.
- (e) Write the time constants 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.

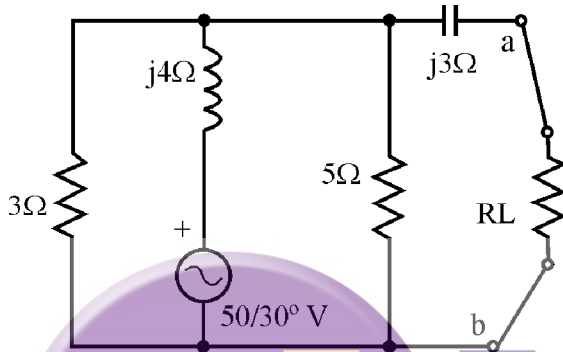
### Section-B

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

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



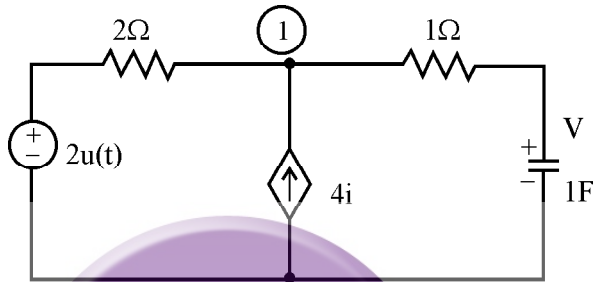
- (b) What should be the value of  $R_L$  so the maximum power can be transferred from the source to  $R_L$  for the given figure.



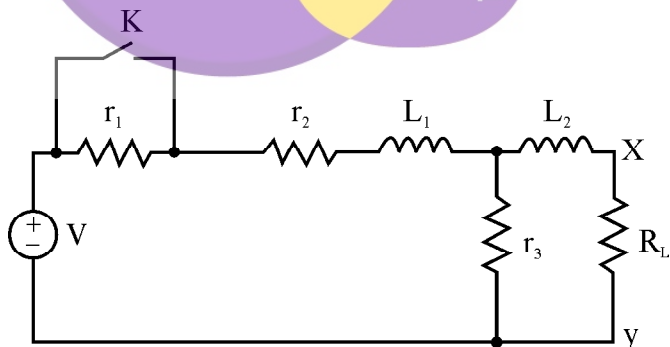
- (c) The reduced incidence matrix is
- $$A = \begin{bmatrix} 1 & 0 & 0 & 0 & -1 \\ -1 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \end{bmatrix}.$$
- Do the following.

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

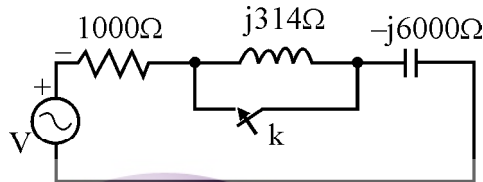
- (d) In figure the initial voltage in the capacitor is 1V with the polarity as shown, find the voltage appearing across the capacitor using Laplace method with application of step voltage 3.



- (e) A network has been shown in figure, the switch K is closed at  $t=0$ . Find the current in  $R_L$  using thevenin 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  $v=100\sin 314t$  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:

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

## 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  $\pi$ -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  $(250+j100)\Omega$  and with c-d short circuited is  $(400+j3000)\Omega$ . The impedance across c-d with a-b open circuited is  $200\Omega$ . 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 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.

