Paper Code: EC-304	Roll No.									

B.Tech.
THIRD SEMESTER EXAMINATION, 2016-17
NETWORK ANALYSIS AND SYNTHESIS

[Time: 3 hrs.] [Max. Marks: 100]

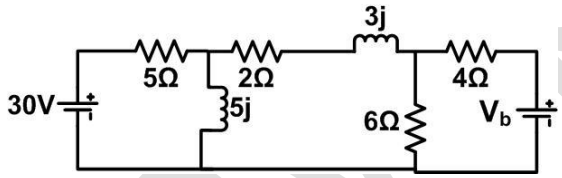
Note- Attempt All questions. All questions carry equal marks.

1. Attempt any four parts of the following:- **[5x4=20]**

(a) Define initial value theorem and final value theorem. Also find initial value and final value of the function: $\boldsymbol{F(s) = \frac{s^3+3s^2+3s+1}{s^2+2s+2}}$

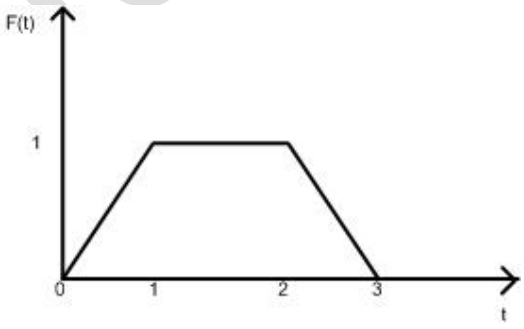
(b) Discuss the transient response of series RLC circuit.

(c) In the network shown in figure, determine the voltage $\mathbf{V_b}$ which results in a zero current through the (2+j3) impedance branch.



(d) With the help of mathematical expressions and characteristics curves, explain Unit step, impulse and ramp signals used to analyze the network.

(e) Express the given function in terms of standard signals and find its Laplace transform.

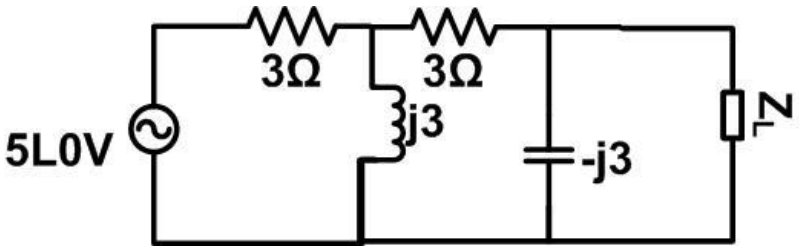


(f) A continuous-time system is modeled by the equation **y(t)=t.x(t)+4**, and a discrete-time system is modeled by **$y[n]=x^2[n]$.**Are these systems time-invariant.

2. Attempt any four parts of the following: - **[5x4=20]**

(a) A voltage having Laplace transform $\frac{4s^2+3s+2}{7s^2+6s+5}$ is applied across 2H inductor having zero initial current. What is the current in the inductor at t=∞.

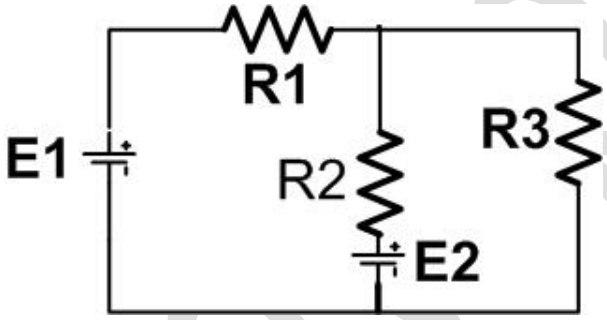
(b) A loudspeaker is connected across terminals A and B of the network. What should its impedance to be obtain maximum power dissipation in it? Also find the value of maximum power.



(c) State and prove the maximum power transfer theorem.

(d) State thevenin's theorem and give a proof of the same. Mention one example of the network where this theorem is not applicable.

(e) Show that thevenin's and norton's theorems are dual to each other. Also draw the dual of following network.

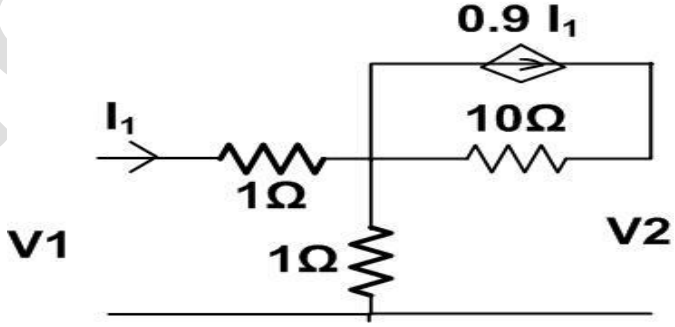


(f) Draw pole zero plot for the given network and hence find $\boldsymbol{V(t) = \frac{4(S+2)s}{(S+1)\,(S+3)}}$

3. Attempt any two parts of the following:- **[10x2=20]**

(a) (i) Express z-parameters in terms of h-parameters for a two port network.

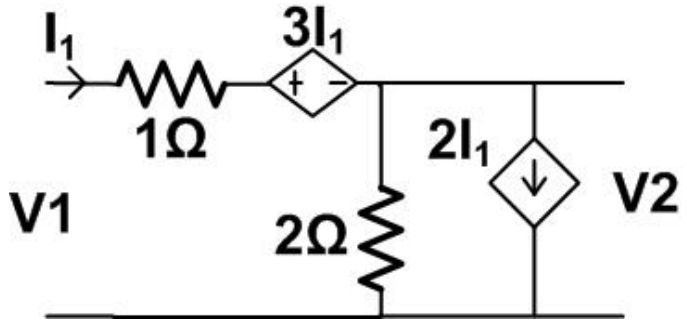
(ii) Find z-parameter of given network.



(b) What do you understand by Hurwitz polynomials? Check whether the following polynomial is Hurwitz or not.

$$\boldsymbol{F(S) = S^7 + 2S^6 + 2S^5 + S^4 + 4S^3 + 8S^2 + 8S + 4}$$

(c) Calculate h-parameter. Also calculate o/p voltage when port 2 is connected to 3Ω resistance and port 1 is connected with 1V power supply.



4. Attempt any two parts of the following:- **[10x2=20]**

(a) Derive the condition for reciprocity and symmetry in case of
(i) h-parameter (ii) y-parameter

(b) Synthesize the first and second foster forms of network for impedance function.

$$\boldsymbol{Z(S) = \frac{3(S+2)(S+4)}{S(S+3)}}$$

(c) Enlist the properties of positive real function. check the positive realness of the given function

$$\boldsymbol{F(S) = \frac{2S^4+7S^3+11S^2+12S+4}{S^4+5S^3+9S^2+11S+6}}$$

5. Attempt any two parts of the following:- **[10x2=20]**

(a) Explain the term "zeros of transmission". Realize the network function $\boldsymbol{Y_{21} = \frac{(S+2)(S+4)}{(S+1)(S+3)}}$ with 1Ω.

(b) Design a low pass active filter at a cut-off frequency of **1 kHz** with a pass band gain **=2**. Using the frequency -scaling technique, convert this filter to a low -pass filter of cut-off frequency 1.6 kHz. Plot the frequency response of this low-pass active filter.

(c) (i) Design a wide band -pass filter with f_{LC} = 200 Hz and f_{UC} =1kHz, and a pass-band gain 4.
(ii) Draw the frequency response plot of this filter.
(iii)Calculate the value of Q for the filter.