

Paper Id 

1	3	0	3	1	4
---	---	---	---	---	---

Roll No. 

--	--	--	--	--	--	--	--	--	--

**B. TECH**  
**THEORY EXAMINATION ( SEM-III) 2018-19**  
**NETWORK ANALYSIS & SYNTHESIS**

Time : 3 Hours

Max. Marks : 100

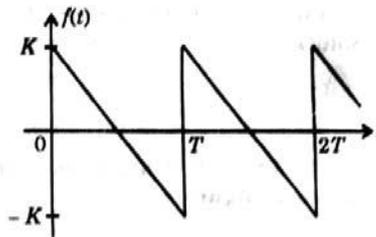
*Note : Be precise in your answer. In case of numerical problem assume data wherever not provided*

**SECTION – A**

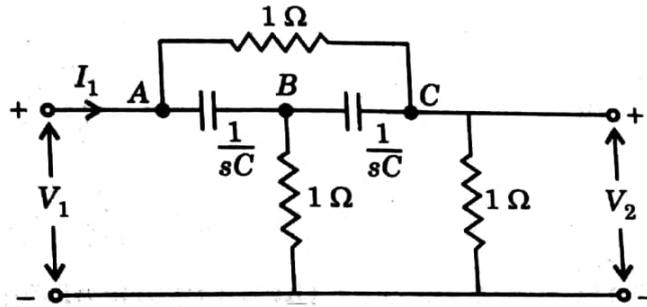
1. Attempt all parts of the following questions: 2×10=20
- (a) With the help of mathematical expressions and characteristics curve, explain unit step and impulse signals used to analyse the network?
- (b) Draw Pole-Zero diagram for following impedance function:
- $$Z(s) = \frac{(s + 1)}{(s^2 + 2s + 2)}$$
- (c) State initial value and final value theorem.
- (d) Explain the concept of transfer function.
- (e) State Thevenin's theorem.
- (f) What is the condition for reciprocity of z-parameter and h-parameter?
- (g) Describe the various elements of a network.
- (h) Define Positive real function.
- (i) What is unilateral Laplace transform? Give the condition for the existence of the Laplace transform.
- (j) Give the statement of superposition theorem.

**SECTION B**

2. Attempt any three parts of the following questions: 3×10=30
- (a) Explain Convolution integral and convolution theorem.
- (b) Determine the Laplace transform of the waveform shown below: -



- (c) What are two port networks? Explain various types of interconnections of two port network.
- (d) Find the driving point impedance  $Z_{11}(s)$ , transfer impedance  $Z_{21}(s)$  and voltage transfer function  $G_{12}(s)$  for the circuit shown in the figure below.

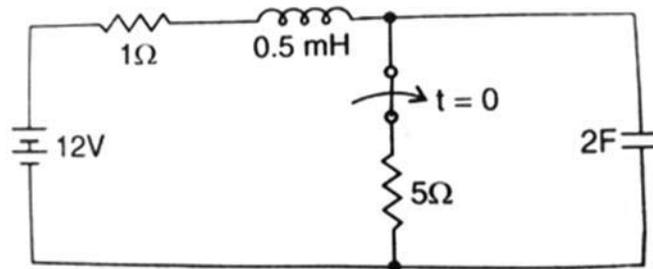


- (e) Write down the properties of Positive real function. Find if the function  $Z(s) = \frac{2s^2+5}{s(s^2+1)}$  is positive real or not.

### SECTION C

3. Attempt any one part of the following question: 1×10=10

- (a) The switch in the circuit of the given figure has been closed for a very long time. It opens at  $t=0$ .

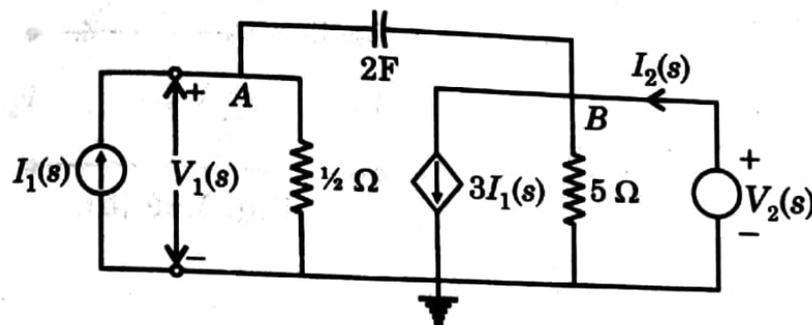


Find  $v_C(t)$  for  $t > 0$  using differential equation approach.

- (b) Design first order high pass active filter and draw its frequency response.

4. Attempt any one part of the following question: 1×10=10

- (a) Determine the h-parameters of the network given in the figure below:-



- (b) If  $I(s) = \frac{s^2+5s+9}{s^3+5s^2+12s+8}$ ; find  $i(t)$ .

5. Attempt any one part of the following question:

1×10=10

(a) Find the range of values of “a” so that following function is a Hurwitz:

$$P(s) = s^4 + s^3 + as^2 + 2s + 3 .$$

(b) What are active filters? List and explain types of active filters.

6. Attempt any one part of the following question:

1×10=10

(a) An impedance function is given by

$$Z(s) = \frac{2(s + 1)(s + 3)}{(s + 2)(s + 6)}$$

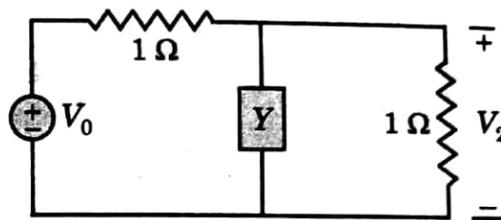
Find the R-C representation of (i) Foster I and (ii) Cauer I form.

(b) Synthesize  $Y_{21}(s) = \frac{s^3}{s^3 + 3s^2 + 3s + 2}$  with  $1\Omega$  termination.

7. Attempt any one part of the following question:

1×10=10

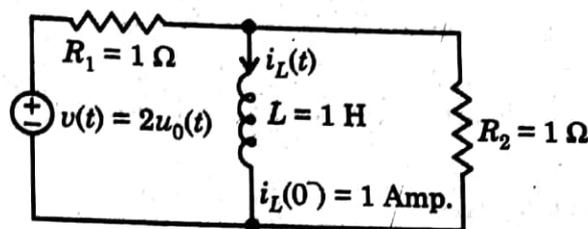
(a) What are the properties of R-L impedance function? For the network shown in the figure below: -



$$\frac{V_2}{V_0} = \frac{1}{2 + Y} = \frac{s(s^2 + 3)}{2s^3 + s^2 + 6s + 1}$$

Synthesize Y as the L-C admittance.

(b) Construct transformed network of the circuit shown in the figure below.



Find out the Laplace transform function  $I_{R_2}(s)$  and then using initial and final value theorems find out the initial and the final value of current  $i_{R_2}(t)$ , through  $R_2$ . Verify the results by solving for  $i_{R_2}(t)$ .