**Printed Pages: 03** **SUB CODE: NEC301**

**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.

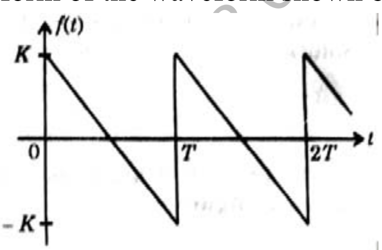
**(j)** Give the statement of superposition theorem.

### SECTION B

**2. Attempt any three parts of the following questions:** **3×10=30**

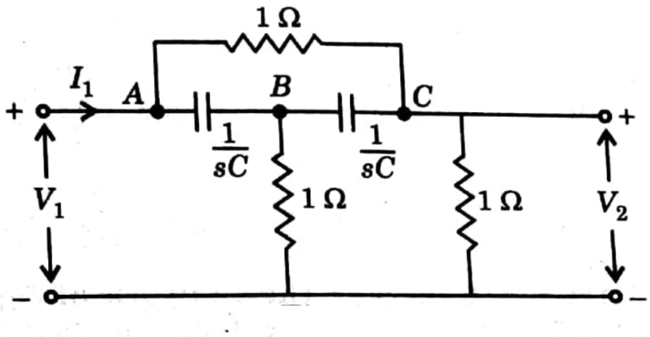
**(a)** Explain Convolution integral and convolution theorem.

**(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.

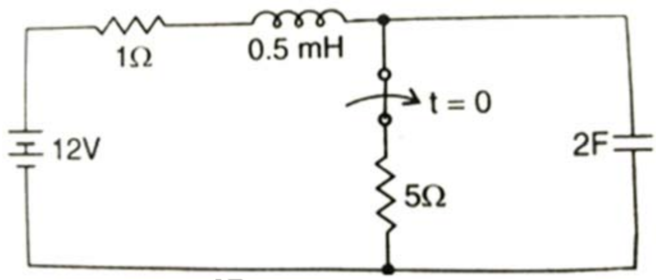



**(e)** Write down the properties of Positive real function. Find if the function $Z(s) = \frac{2s^2+5}{s(s^2+1)}$ is positive real or not.

## 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.

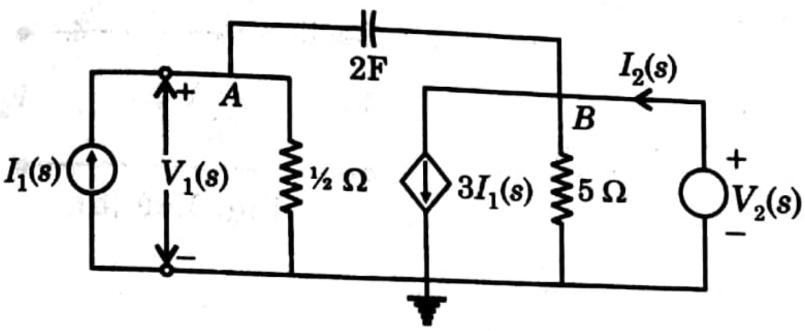



Find $v_C(t)$ for $t > 0$ using differential equation approach.

**(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

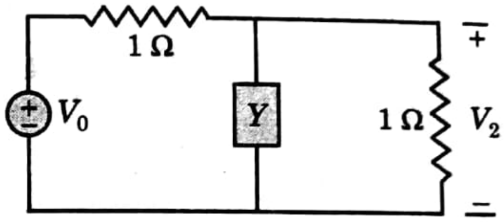
$$Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$$

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 1Ω termination.

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

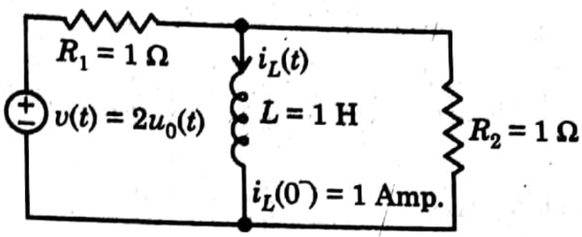
**(a)** What are the properties of R-L impedance function? For the network shown in the figure below: -




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

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 $I_{R2}(s)$ and then using initial and final value theorems find out the initial and the final value of current $i_{R2}(t)$, through $R_2$. Verify the results by solving for $i_{R2}(t)$.