SE SEM-IV EXTC C-scheme May 2026
Date: 19/05/2026

Duration: 3hrs [Max Marks:80]

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 **Attempt any FOUR** [20]

a Sketch its even and odd parts of :

$$x(t) = \frac{2}{5} t\, u(t) \quad \ldots\ldots 0 \le t \le 5$$

b Consider a discrete time system shown in Fig. 1

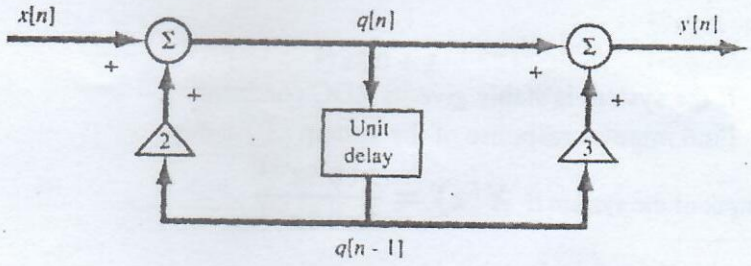


Fig 1

Write the difference equation for this system which relates the output y(n) with input x(n). Also state whether the system is FIR or IIR.

c Obtain the Laplace transform of the given Square wave (Fig 2)

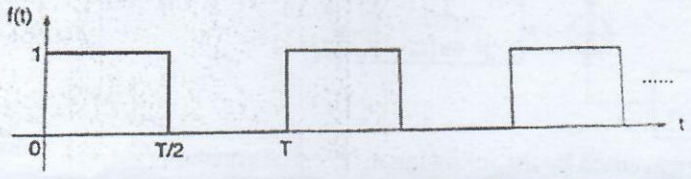


Fig. 2.

d Explain the Gibb's phenomenon and the conditions necessary for the convergence of the Fourier Series

e Discuss the limitations of Fourier Transform.

2 a A certain system has the impulse response h(t) and input x(t) as shown in Fig 3. [10]

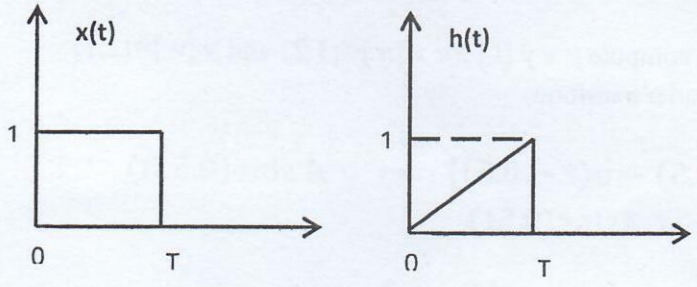


Fig. 3

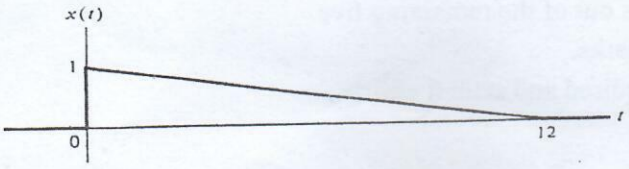
Obtain the output for the given system without using any transform.

b Classify the following sytems as Linear/nonlinear, time variant / invariant Causal/Noncausal and static/dynamic. [10]

i. $y[n] = x[n^2]$

ii. $y(t) = x(t) + x(t+2)$

3 a For the given signal x(t) [10]



Sketch

1. $x(1-t)[u(t+1)-u(t-2)]$
2. $x(t)[\delta\left(t-\frac{3}{2}\right)]$

b A causal LTI system has a transfer function $H(z) = H_1(z).H_2(z)$ where [10]

$H_1(z) = \frac{1-0.2z^{-1}}{1+0.5z^{-1}}$ and $H_2(z) = \frac{1}{1+0.3z^{-1}}$

i. If the system is stable give its ROC condition.

ii. Find impulse response of the system

Find the output of the system if $X(z) = \frac{1+0.3z^{-1}}{1-0.2z^{-1}}$

4 a An audio tone x(t) is passed through a two band audio equalizer followed by amplifier as shown in Fig.4. Obtain the Overall Transfer function of this system using Laplace transform. [10]

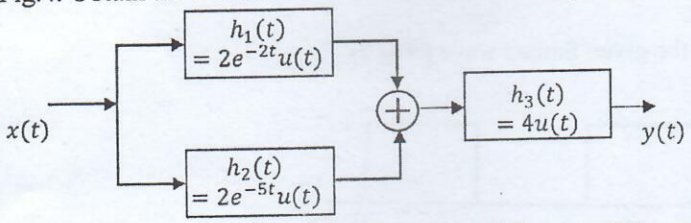


Fig 4

b A second order RC filter is governed by the following differential equation [10]

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy}{dt} + 4y(t) = \frac{dx(t)}{dt}$$

Obtain the filtered output if the input signal is $x(t) = e^{-2t}u(t)$,

$$\textit{Assume initial conditions } y(0) = 1;\ \left.\frac{dy}{dt}\right|_{t=0} = 1$$

5 a Define cross-correlation and compute $r\,x\,y\,[l\,]$ for $x\,[n\,]=\{1,2\}$ and $y\,[n\,]=\{2,1\}$ [10]

b State the duality theorem of Fourier transform. [10]

If the Fourier transform of

$$A[u(t+0.5)-u(t-0.5)] \quad \leftrightarrow \quad A\,sinc(0.5\,\Omega)$$

Then find the Fourier transform of $Asinc(0.5t)$

6 [20]

Write short notes on

a ROC of Z transform

b Properties of Autocorrelation

c Difference between FIR and IIR filters

d Properties of Laplace transform

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