(3 Hours) **[Total Marks:80]**

N.B.:

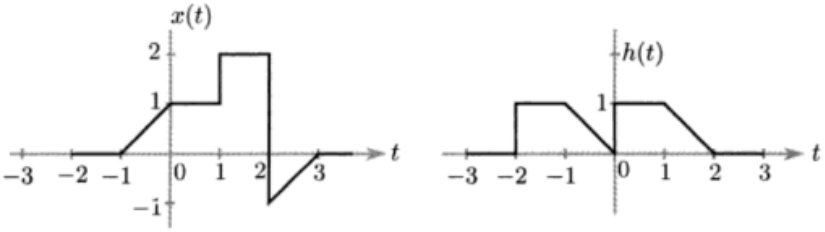
1. Question No.1 is compulsory.

2. Attempt any three questions out of the remaining five.

3. Assume suitable data wherever necessary.

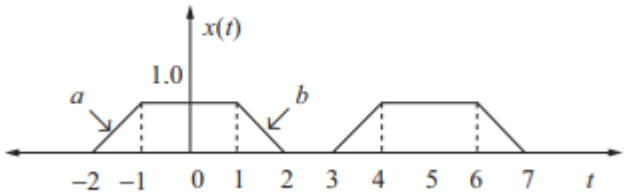
Q1].Answer the following [20]

a) Sketch even and odd parts of $e^{-t}\,u(t)$
b) State and prove time shifting property of Continuous Time Fourier Transform.
c) Explain properties of ROC in Laplace Transform.
d) Consider the following signal $x(t)$ and $h(t)$
find $x(t)h(t+1)$, $x(t)h(-t)$, $x(t-1)h(1-t)$ and $x(1-t)h(t-1)$.



e) Describe Gibbs Phenomenon in signal generation.

Q2] (a) Compute the exponential Fourier Series of $x(t)$ [10]



Q2b) Determine Laplace transform and ROC of [10]

$e^{2t}\,u(t) + e^{-2t}\,u(-t)$,

Q3a) Sketch following signals [10]

(i) $x(n) = u(n+2)u(-n+3)$
(ii) $x(n) = u(n+4) - u(n-2)$

Q3b) Find the transfer function and unit sample response of the second order difference equation with zero initial condition y (n) = x(n) - 0.25y(n-2) . [10]

Q4a) Find the transfer function of the systems governed by following impulse response [10]

h (t) = (2+t) e^{-3t} u(t)

Q4b) Find Fourier transform of following signals

(a) $e^{at}u(-t)$ [5]

(b) $te^{-at}u(t)$ [5]

Q5a) Find DTFT of x (n) = $(\frac{1}{4})^n$ u(n+1) [5]

Q5b) Determine discrete time Fourier series of x (n) = $2\sin\sqrt{3}\ \pi n$ [5]

Q5c) Determine cross correlation of sequence x (n) = {1, 1, 2, 2} and y (n) = {1, 3, 1} [10]

Q6a) Perform convolution of $x_1(t) = cost\ u(t)$; $x_2(t) = u(t)$ using convolution integral. [10]

Q6b) Using long division, determine the inverse Z-transform of [10]

X (z) = $\frac{z^2+z+2}{z^3-2z^2+3z+4}$; ROC;$|Z| < 1$

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