

(3 Hours)

[Total Marks:80]

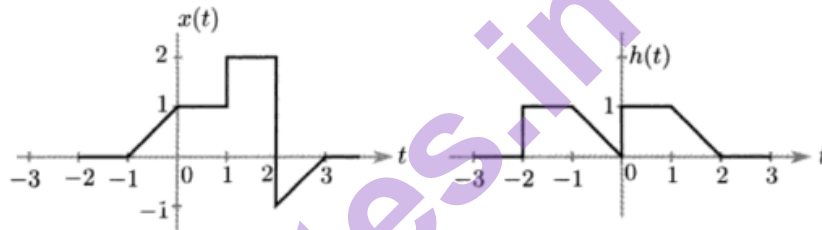
N.B.:

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]

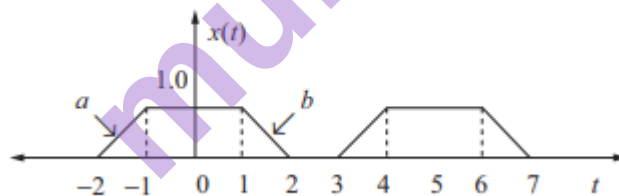
- a) Sketch even and odd parts of  $e^{-t} u(t)$
- b) State and prove time shifting property of Continuous Time Fourier Transform.
- c) Explain properties of ROC in Laplace Transform.
- d) Consider the following signal  $x(t)$  and  $h(t)$   
find  $x(t)h(t+1)$ ,  $x(t)h(-t)$ ,  $x(t-1)h(1-t)$  and 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



- 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  $x(n) = \left(\frac{1}{4}\right)^n u(n+1)$  [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  $x_1(t) = \cos t u(t)$ ;  $x_2(t) = u(t)$  using convolution integral. [10]

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

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

\*\*\*\*\*