(3 Hours) **[Total Marks80]**

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 Test given system for Linearity,Causality,Stability,Memory and Time Invariant
$y(t)= x(2t)$

b Explain the concept of ROC in Z tranform and Laplace Transform

c Discuss the application of Signals in Control systems.

d Determine the relationship between CTFT and LT

e Find the z-transform of $x(n) = a^n u(n)$ and sketch the RoC

2 a $x(t) = 2, 0 \le t \le 6$ [10]
$= 0$, elsewhere
Sketch x(t), x(-t), -x(t), x(t-2), x(t+3), 2x(t), x(2t), x(t/2), x(t) + x(-t) and x(t) – x(t-2)

b Find x[n] using partial fraction method from $X(z) = 1/(1 – 1.5z^{-1} + 0.5z^{-2})$ [10]

3 a For a LTI system, input x(t) and impulse response h(t) are given below. Find the output using convolution. [10]
$x(t) = h(t) = A, -T \le t \le T$
$= 0$, elsewhere

b Find the Z Transform of $x(n) = 0.5^n u(n)+ 0.8^n u(-n-1)$. Also specify ROC [10]

4 a find Continous time Fourier Transform of x(t) = A for -T/2 < t<T/2 [10]

b find continous time fourier Transform of x(t) = cos (2 pi f_{ot} t) [10]

5 a Find the Laplace transform of x(t) = u(t)-u(t-a) where a > 0 and sketch the RoC. [10]

b Find the transfer function H(z) and impulse response h[n] of a discrete time system with I/O relation y[n] – 0.5y[n-1] = x[n] + 2x[n-1] [10]

6 a x[n] = [1, 3, 1 <u>2</u>]. Sketch x[n], x[n+1], x[n-1], x[-n], x[-n +2], x[-n-2], x[2n], Underline in x[n] shows origin. [10]

b Realize the system uisng Direct form I and II, cascase and parallel form [10]
y(n)- 5y(n-1)+6y(n-2)=x(n) +0.3x(n-1)