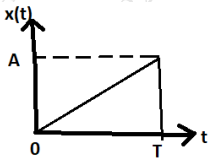
Time: 3 Hours **Max. Marks: 80**

Note: -1. Question no. 1 is compulsory.
2. Answer any three out of remaining questions.
3. Figures to right indicate full marks.
4. Assume suitable data wherever necessary.

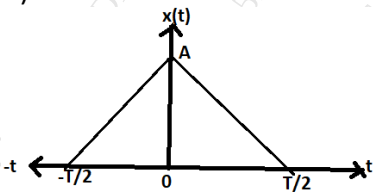
Q.1 **Attempt any 4 questions** **20**

a) What is Mathematical representation of following signals

i)



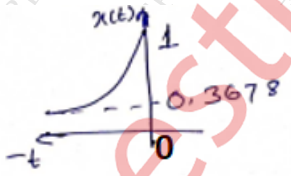
ii)



b) State &prove time scaling property of Laplace transform

c) Obtain Z transform of
y(n)=u(n)+4 u(n-2) + 6 u(n-3) + 7 u(n-4) using properties.

d) Obtain fourier transform of given signal



e) Define ROC for Z transform along with properties.

Q.2 a) Check whether the system is i) linear ii) time variant iii)causal **10**
iv)memoryless
x(n)= n x(n)

b)Perform convolution **10**
x(t)=1 for 0 ≤t ≤2
h(t)=1 for 0 ≤t ≤1
= -1 for 1 ≤t ≤2

Q.3 a) Obtain Inverse Laplace transform of x(s) = $\frac{4}{(s+1)(s+2)^2}$ for all possible region of convergence **10**

b) for the given differential equation **10**

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = 7\frac{dx(t)}{dt} - 3x(t)$$

i)determine transfer function
ii)Obtain impulse response

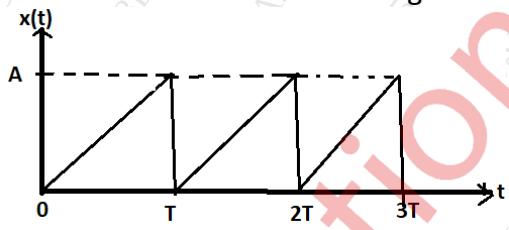
Q.4 a) The transfer function of causal L.T.I. system is **10**

H(z) = $\frac{1-Z^{-1}}{1+(\frac{3}{4})Z^{-1}}$

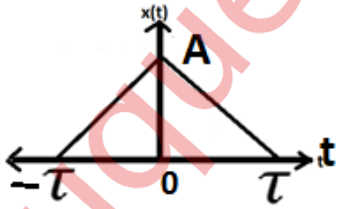
i) find impulse response
ii) find the output of the system to the input x(n)= $(\frac{1}{3})^n$ u(n) + u(-n-1)

b) Find Z transform using properties and sketch ROC for the following signal. **10**
(i) x(n) = $(n)^2$ u(n)
(ii) x(n) = a^n u(-n-1)

Q.5 a) Obtain the fourier series and sketch amplitude and phase spectrum of the sawtooth waveform shown in figure **10**



b) Obtain the fourier transform and sketch amplitude spectrum **10**



Q.6 a) Obtain DTFT (Discrete Time Fourier Transform) of the following **10**
i)x(n)=u(n)
ii)x(n)= a^{-n} u(-n-1)

b) Determine the spectra of periodic signal using **10**
DTFS (Discrete Time Fourier Series) x(n)={1,1,1,0} with N=4