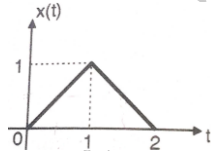**Time: 3 Hours** **Max. Marks: 80**

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.

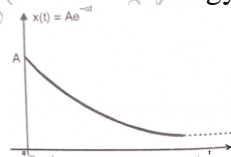**Q.1** **Attempt any four questions** **(20 Marks)**

a) Sketch even and odd part of the given signal

b) Find the Laplace transform of $x(t)=(t-3)^2$ using time shifting property

c) Determine energy of $A\ e^{-\alpha t}\ u(t),\ \alpha>0$ signal

d) Check linearity of given signal
(i) $Y(n) = n\ x^2(n)$
(ii)_ $Y(n)= n^2\ x(n)$

e) State and prove differentiation property of Z transform

Q.2 a) If $x(s)=\frac{s+2}{s^2+4s+5}$, find Laplace transform using properties of following **(10 Marks)**
signal
i) $y(t)=x(2t-1)\ u(2t-1)$ ii) $y(t)= t\ x(t)$

b) Perform Convolution operation of the following signals in time domain. **(10 Marks)**
$x_1(t) = e^{-4t}\ u(t)$ $x_2(t) = u(t-4)$

Q.3 a) Find inverse Z transform for all possible ROC of the following **(10 Marks)**
$X(Z)=\frac{Z+0.3}{(Z+0.2)(Z+0.5)}$
b) Obtain Z transform using property of signal i) $x(n)=u(-n)$ ii) $(-1)^n\ 2^{-n}\ u(n)$ **(10 Marks)**

Q.4 a)Determine an impulse response of a system described as **(10 Marks)**
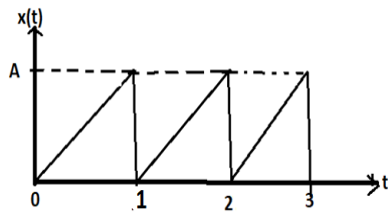$y(n)=x)n)+0.6\ y(n-1)-0.08y(n-2)$
b) Find the inverse Laplace Transform of $x(s)=\frac{3s+7}{s^2-2s-3}$ for all possible ROC **(10 Marks)**

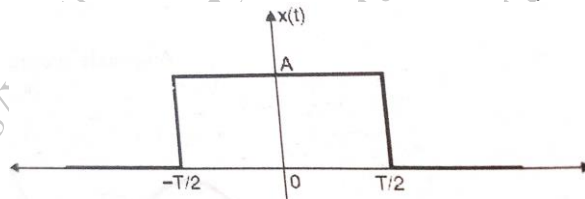**Q.5** a) Find Fourier transform of **(10 Marks)**
i) Delta function   ii) Signum function.
b) Obtain the Fourier series ,amplitude and phase spectrum of the sawtooth **(10 Marks)**
waveform shown in figure

Q.6 a) Obtain the Fourier transform and sketch amplitude spectrum **(10 Marks)**

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

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