

Time: 3 Hours

Max. Marks: 80

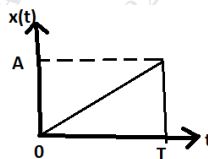
- Note: -1. Question no. 1 is compulsory.
 2. Answer any three out of remaining questions.
 3. Figures to right indicate full marks.
 4. Assume suitable data wherever necessary.

Q.1 Attempt any 4 questions

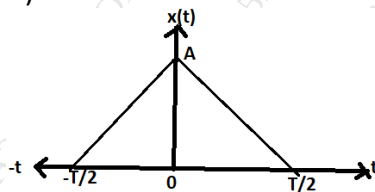
20

a) What is Mathematical representation of following signals

i)



ii)

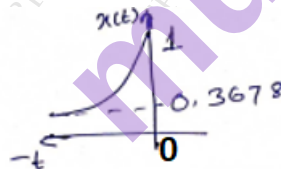


b) State & prove time scaling property of Laplace transform

c) Obtain Z transform of

$$y(n) = u(n) + 4u(n-2) + 6u(n-3) + 7u(n-4) \text{ using properties.}$$

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

$$x(t) = 1 \text{ for } 0 \leq t \leq 2$$

$$h(t) = 1 \text{ for } 0 \leq t \leq 1$$

$$= -1 \text{ for } 1 \leq t \leq 2$$

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**

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

i) determine transfer function

ii) Obtain impulse response

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

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

i) find impulse response

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

b) Find Z transform using properties and sketch ROC for the following signal. **10**

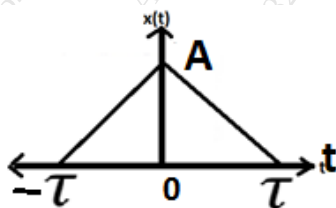
(i) $x(n] = (n)^2 u(n)$

(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 $N=4$