

3 Hours

Total marks: 80

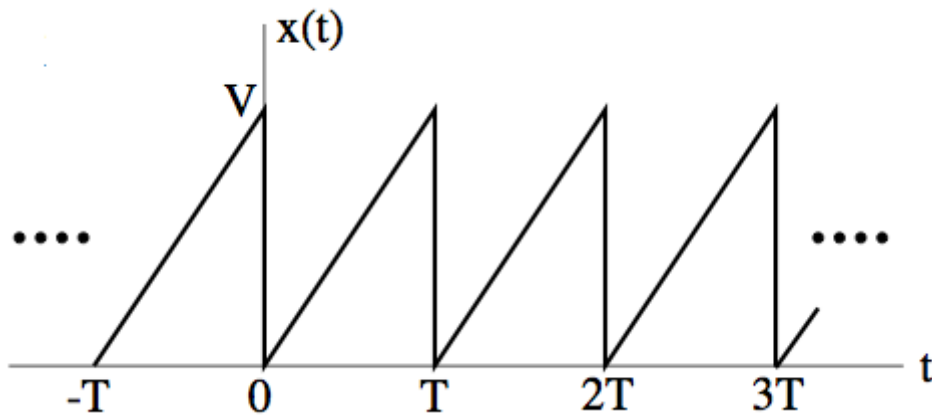
- Question no. 1 is compulsory
- Attempt any Three questions from remaining

- Q1. Answer any 4 questions from the given questions: 20
- Find even and odd part of following continuous time signals
 - $X(t) = 3 + 2t + 5t^2$.
 - $x_2(t) = \sin 2t + \cos t + \text{sinc} 2t$
 - Determine energy and power of the unit step signal
 - Explain the application of Signals and System in Multimedia Processing.
 - Construct the block diagram of discrete time systems whose input output relations are described by following difference equations
 - $Y_1(n) = 0.5x(n) + 0.5x(n-1)$
 - $Y_2(n) = 0.25y_1(n-1) + 0.5x(n) + 0.75x(n-1)$
 - Test the given system for linearity, causality, stability, memory and time variant.

$$y(t) = x(t^2)$$
 - Give advantages of state space analysis for system analysis
- Q2. Perform convolution of $x_1(t) = e^{-3t}u(t)$ and $x_2(t) = tu(t)$ using mathematical method and also by graphical method. 20
- Q3.a. Determine the sequence $x[n]$ associated with Z-Transform 10
- $$X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$
- Find the impulse response $h(n)$ of the system if the spectrum is given by 10
- $$H(e^{j\omega}) = \frac{1}{3} (1 + \cos \omega)$$
- Q4.a. Explain the procedure to obtain transfer function of system from state model of the system. 10

b. Find exponential Fourier series for $x(t)$

10



Q5.a Determine Fourier transform of gate function given by $x(t) = A$ for $|t| \leq \frac{T}{2}$ 8

b. Find Laplace transform of $x(t) = u(t) - u(t - a)$. 4

c. Find Initial and final value using Laplace transform 8

$$X(s) = \frac{7s + 6}{s(3s + 5)}$$

Q6. Write short note on **any two**: 20

a. Relation of ESD, PSD with auto-correlation

b. ROC in Z-Transform and Laplace Transform

c. Feedforward Control system
