

2056
B.E. (Electrical and Electronics Engineering)
Sixth Semester
PC-EE-604: Signals and Systems

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Answer the following:-

a) Sketch the signal $x(t) = \begin{cases} -\frac{1}{2} & \text{for } t < 0 \\ \frac{1}{2} & \text{for } t > 0 \end{cases}$

b) Determine whether the signal $x(t) = \cos \frac{\pi}{3} t$ periodic or not. If it is periodic, find its fundamental period.

c) What are singularity functions?

d) State and prove the Parseval's relation for discrete time Fourier transform.

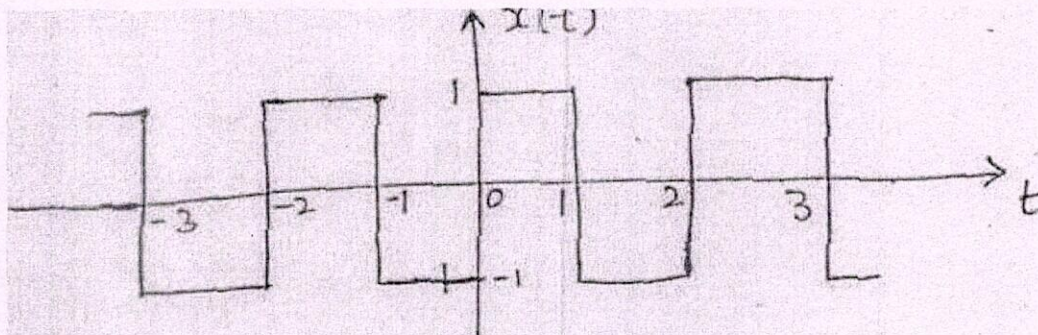
e) If discrete Fourier series coefficient of $x(n)$ is a_k , what will be the Fourier series coefficient of $x(n-m)$? (5x2)

UNIT - I

II. a) What is a system? Mention the properties of a system,

b) Find the response $y(t)$ if $x(t) = e^{-at}U(t+3)$, $h(t) = e^{-at}U(t-1)$ using convolution. (5,5)

III. a) Find the Fourier series coefficients for the given signal



(b) Mention any six properties of discrete time Fourier series. (5,5)

IV. a) A causal LTI system is described by the differential equation as

$$\frac{d^2 y(t)}{dt^2} + \frac{4dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t)$$

Calculate:

(i) Impulse response of the system

(ii) Step response of the system

b) What is filtering? Discuss continuous time filters described by differential equations.

(5,5)
P.T.O.

(2)

UNIT - II

- V. a) State and prove the sampling theorem.
 b) For the signal $x(t) = 2\sin(100\pi)t - \cos(200\pi t)$, what will be the minimum sampling frequency?
 c) Mention the first difference property of discrete time Fourier transform. (5,3,2)
- VI. a) A discrete time LTI system is represented by $H(e^{j\omega}) = \frac{1}{1 + \frac{1}{2}e^{-j\omega} - \frac{1}{8}e^{-j2\omega}}$
 Find the difference equation representing the input-output relationship of a discrete time system.
 b) Find the inverse Fourier transform of $X(e^{j\omega}) = \cos^2 \omega + \sin^2 3\omega$. (5,5)
- VII. a) State the Hilbert transform and its properties.
 b) Find the Hilbert transform of
 i) $S(t)$
 ii) $\cos \omega_0 t$ (5,5)

x-x-x