CSE 225 (R-20)

Total No. of Questions : 10] [Total No.of Pages : 02

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

Second Semester

COMPUTER SCIENCE AND ENGINEERING

SIGNALS AND SYSTEMS

Time : **Three Hours** Maximum : **70** Marks

Answer ONE question from each Unit. 5x14=70 M

All Questions carry equal marks.

UNIT - I

1. A rectangular function defined by $f(t) = \begin{cases} 1, & 0 < t < \pi \\ -1 & \pi < t < 2\pi \end{cases}$. Approximate this function by a single sinusoid sin t, evaluate mean square error in this approximation. Also show what happens when more number of sinusoidal are used for approximations.

(OR)

2. a) Define the error function 'fe (t)' while approximating signals and hence derive the expression for condition for orthogonality between two waveforms f1(t) & f2(t).

   b) Test whether the signal x(n) = (1/2) n u(n) energy or power signal.

UNIT - II

3. a) Discuss the concept of trigonometric Fourier series and derive the expressions for coefficients.

   b) Determine the Fourier transform of a two sided exponential pulse $x(t) = e^{-|t|}$.

(OR)

4. a) State and prove time convolution and time differentiation properties of Fourier Transform.

   b) Obtain the Fourier transform of the following functions :

   (i) Impulse function (ii) DC signal (iii) Unit step function.

UNIT - III

5. a) Obtain the relationship between the bandwidth and rise time of ideal low pass filter.

P.T.O.

b) Let the transfer function of an LTI system be $\frac{1}{(jw+2)}$. What is the output of the system for an input $(0.8)^t$ u(t).

(OR)

6. a) Find the response of an ideal low pass filter when unit step signal is applied as an input.

b) Explore the filter characteristics of linear systems and conditions for distortion less transmission.

UNIT - IV

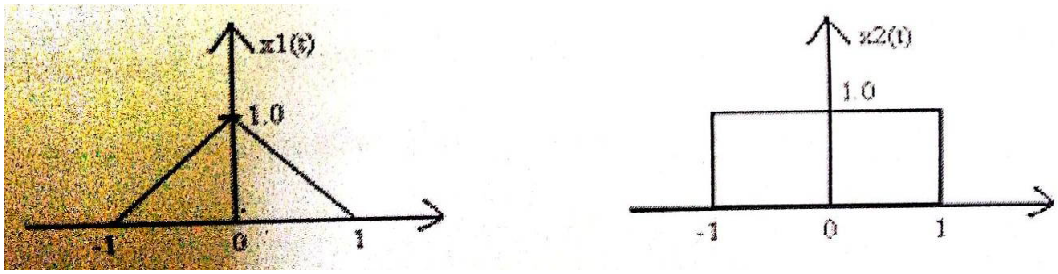
7. a) Prove that autocorrelation function and energy spectral density function forms a Fourier transform pair.

b) A signal x(t) has energy E, calculate the energy of the signal x(3t).

(OR)

8. a) What is aliasing ? Explain its effect on sampling.

b) Find the Cross correlation between triangular and gate function as shown in below figure.



UNIT - V

9. a) State and prove time convolution property of Laplace Transform.

b) Determine the inverse laplace of the following functions :

(i) $\frac{1}{s(s+1)}$ (ii) $\frac{3s^2+8s+6}{(s+2)(s^2+2s+1)}$

(OR)

10. a) Obtain the inverse Laplace transform of $G(s) = \frac{s}{(s-3)(s^2-4s+s)}$ $Re(s) < 2$.

b) Find the Laplace transform of $x(t) = te^{-at}$ u(t) and indicate its ROC.