



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021

Regulation: R18

SIGNALS AND SYSTEMS

Time: 3 Hours

(ECE)

Max Marks: 70

**Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)**

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

1. (a) Derive the expression for evaluating mean square errors and its types. [7M]
(b) A continuous-time signal $x(t)$ is shown in Figure 1. [7M]

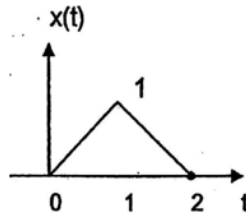


Figure 1

- i) Sketch $y(t) = 2x(-0.5t + 2)$
ii) Sketch the even and odd part of the signal $x(t)$.
2. (a) Define and sketch the following elementary continuous time signals:
i) Unit impulse signal ii) Unit step signal iii) Unit ramp signal [7M]
(b) Find, whether $x(t) = Ae^{-at}u(t)$ for $a > 0$ is an energy signal or power signal. [7M]

MODULE – II

3. (a) Obtain the Fourier transform of the following functions:
i) Impulse signal ii) Single symmetrical gate pulse. [7M]
(b) Find the Fourier transform of the function $x(t) = te^t u(t + 2)$ [7M]

4. (a) State and prove any four properties of continuous time Fourier series. [7M]
 (b) Find the Fourier series coefficient of the signal $x(t)$ shown in Figure 2. [7M]

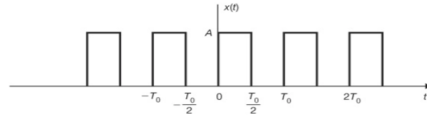


Figure 2

MODULE – III

5. (a) What is cross correlation? Explain the properties of cross correlation [7M]
 (b) Compute the output $y(t)$ for a continuous time LTI system whose impulse response $h(t)$ and the input $x(t)$ are given by
 $x(t) = u(t) - u(t - 3)$, $h(t) = u(t) - u(t - 2)$ [7M]
6. (a) What is linear time invariant (LTI) system? Derive an expression for the transfer function of LTI system. [7M]
 (b) Use graphical method to find out the convolution of two sequences
 $x_1[n] = [1, -1, 2, 3]$ and $x_2[n] = [1, -2, 3, -1]$ [7M]

MODULE – IV

7. (a) What is meant region of convergence (ROC) in Laplace transforms? Discuss the properties of ROC for Laplace transform. [7M]
 (b) Find the inverse Laplace transform of the following function
 $X(s) = \frac{2s+4}{s^2+4s+3}$ where $\text{Re}(s) < -3$ [7M]
8. (a) What is condition for existence of Z- transform? State and prove any two properties of Z- transformation. [7M]
 (b) Find the Z-transform of the following discrete time signal
 $x(n) = n \left(\frac{1}{3}\right)^n u(n) + 0.5 \left(\frac{1}{3}\right)^n u(n)$ [7M]

MODULE – V

9. (a) What is aliasing and how it can be minimized? Write the condition to avoid the aliasing effect? [7M]
 (b) State and prove Nyquist sampling theorem. What is the Nyquist's Frequency for the signal
 $x(t) = 3 \cos 50t + 10 \sin 300t - \cos 100t$? [7M]
10. (a) State and prove the sampling theorem for a band limited signal. Explain about band pass sampling. [7M]
 (b) Prove that the auto-correlation function and energy density spectrum form a Fourier transform pair. [7M]

