



B.Tech III Semester Regular Examinations, February 2022
SIGNALS AND SYSTEMS

(Electronics & Communication Engineering)

Maximum Marks: 70

Date: 24.02.2022 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 Determine whether a unit step signal $u(t)$ is energy or power signal.
- 2 Define orthogonal signals.
- 3 State the Dirichlet's conditions for existence of Fourier Transform.
- 4 Define Fourier transform.
- 5 Compute the Laplace transform of $x(t) = e^{-b|t|}$
- 6 What are the effects of aliasing and how can you minimize the aliasing error?
- 7 Define convolution.
- 8 Define ESD.
- 9 Is the system described by the equation $y(t) = x(2t)$ time invariant or not? Why?
- 10 Define transfer function and impulse response of LTI system.

Part-B

Answer All the following questions.

(5x10M=50Marks)

- 11 a) Explain about the complete set of orthogonal functions. Discuss the orthogonality in complex signals. (6M)
b) Define periodic and non-periodic signals. (4M)

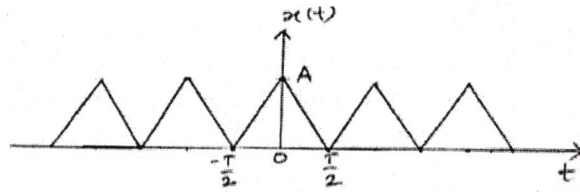
OR

- 12 Obtain the condition which two signals $x_1(t)$ and $x_2(t)$ are said to be orthogonal to each other. Hence prove that $\cos(n\omega_0 t)$ and $\cos(m\omega_0 t)$ are orthogonal over interval $(t_0, t_0 + 2\pi/\omega_0)$ for integer values of n and m . (10M)

- 13 State and prove any four properties of Fourier Transform. (10M)

OR

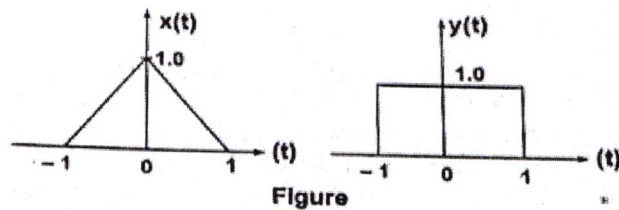
- 14 Determine the Trigonometric form of the Fourier series representation of the signal shown below. (10M)



- 15 State and prove time convolution theorem property of Laplace transform. Use the convolution theorem of Laplace transform to find $y(t) = x_1(t) * x_2(t)$ where $x_1(t) = \cos(4t) u(t)$ and $x_2(t) = \sin(2t) u(t)$. (10M)

OR

- 16 a) Discuss the process of performing sampling by natural sampling method and also compare with other sampling techniques. (5M)
b) State and prove sampling theorem for band limited signals using analytical approach. (5M)
- 17 Define correlation of a signal. Find the cross correlation between triangular and gate functions shown in below figure. (10M)



OR

- 18 a) Write short notes on auto correlation and cross correlation functions of energy and power signals. (6M)
b) Compare ESD and PSD. (4M)
- 19 Explain about the distortion less transmission through a linear system. (10M)
- OR
- 20 a) Write about the relationship between Bandwidth and Rise time in linear system. (5M)
b) Explain causality and physical realization of a system and explain Paley-wiener criterion. (5M)