R17 Regulation *Subject code: 1P3DD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech II Year I Semester Supplementary Examinations, July 2024

Signals and Stochastic Process

ECE

Maximum Marks: 70 Date:25.07.2024 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	What are orthogonal functions?
2	What is the condition on magnitude and phase for distortion less transmission?
3	Define nyquist rate and nyquist interval?
4	State the conditions for the existence of Fourier series.
5	Find laplace transform of $e^{-at}u(t)$.
6	Find z- transform and ROC of $x[n]=-a^n u(-n-1)$.
7	Give an example of a deterministic random process.
8	Write short notes on Gaussian random process.
9	Write the expression for power spectral density.
10	The output of a filter is given by Y(t)=X(t+T)+X(t-T), where X(t) is a WSS process, power spectral density Sxx(w), and T is a constant. Find the power spectrum of Y(t).

Part-B

Answer All the following questions. (10M X 5=50Marks)

11	(a) Define the error function while approximating signals and hence derive the expression for condition for orthogonality between two waveforms f1(t) and f2(t). (b) Show that x(t)=2,y(t)=1-2t are orthogonal over the interval [0,1].	[7+3]
	OR	
12	(a) Derive the relationship between rise time and bandwidth. (b) Write a short notes on Ideal filters.	[5+5]
13	(a)Expand following function f(t) by trigonometric Fourier series over the interval (0,1). In this interval f(t) is expressed as f(t) = At . (b) State and prove multiplication property of continuous time Fourier series.	[6+4]
	OR	
14	(a) Find the Fourier Transform of signum function (b) State and prove time reversal, time shifting and time scaling properties of Fourier Transform.	[4+6]

15	(a) Prove that $x(t)= e^{-at}u(t)$ and $x(t)= -e^{-at}u(-t)$ have the same X(S) and differ only in ROC. Also plot the ROC. (b) State and prove time shifting property and shifting in S-domain property. [5+5]
	OR
16	(a)State and prove initial value and final value theorems of Z-Transform. (b) Find the inverse Z-Transform of $X(Z)=\frac{z}{(Z-1)(Z-1/2)}$. [5+5]
17	(a)Explain briefly about Gaussian and Poisson Random Process. (b) Show that the random process $X(t) = A\cos(\omega_0 t+\theta)$ is wide-sense stationary if it is assumed that A and ω_0 are constants and θ is a uniformly density random variable over the interval $(0,2\pi)$. [4+6]
	OR
18	(a)Define autocorrelation function of a random process. Write its properties and prove any two of them. (b) Explain the concept of time average and ergodicity. Write the conditions for a random process to be ergodic in mean and autocorrelation. [5+5]
19	Derive the relationship between cross-power spectrum and cross correlation function. [10]
	OR
20	(a) Compare and contrast Auto and cross correlations. (b) If $Y(t) = A \cos(w0t+\theta)+N(t)$, where '$\theta$' is a uniform random variable over $(-\pi,\pi)$, and N(t) is a band limited Gaussian white noise process with PSD=K/2. If 'θ' and N(t) are independent, find the PSD of Y(t). [4+6]