R20 Regulation *Subject code: 3P3DD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, February 2024

SIGNALS AND SYSTEMS

(ECE)

Maximum Marks: 70 Date: 23.02.2024 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)		CO	Bloom Tx
1	What is an orthogonal function?	CO1	L1
2	Define a unit step function and plot $u(t-3)$	CO1	L1
3	Compare Fourier series and Fourier transform.	CO2	L1
4	Define Gibb's phenomenon.	CO2	L1
5	What is meant by of region of convergence (ROC) in Laplace transforms?	CO3	L1
6	Define Nyquist's rate.	CO3	L1
7	What is Cross correlation?	CO4	L1
8	What are incoherent signals.	CO4	L1
9	What is the significance of state transition matrix.	CO5	L1
10	Define a state.	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)				
11	(a) Derive an expression for computing Mean Square Error in approximating a function x(t) by a set of 'n' orthogonal functions (b) Test whether the continuous time impulse signal is either energy or power signal.	5M 5M	CO1	L2
	OR			
12	(a) Prove that Sin ($n\omega_0 t$) & Cos ($m\omega_0 t$) are orthogonal to each other over the interval (to ,to+2π/w). (b) Test whether the signal $x(n) = (½)^n u(n)$ energy or power signal	5M 5M	CO1	L3 L2
13	(a) State and prove the convolution property of Fourier transform. (b)Find the Fourier transform of $x(t) = 100e^{-10t}$.	5M 5M	CO2	L2 L3
	OR			
14	(a) State the Dirichlets conditions for existence of Fourier series. (b) Bring out the relationship between Trigonometric and Exponential Fourier series.	5M 5M	CO2	L2
15	(a) Why sampling theorem is called low pass sampling theorem?	5M	CO3	L2

	(b)The signal g(t) = 10 cos(20πt) cos(200πt) is sampled at the rate of 250 samples per second. What is the Nyquist rate for g(t) as a low-pass signal and determine the lowest permissible sampling rate for this signal?	5M		L3
	OR			
16	(a) State and prove frequency shifting property of Laplace Transform. (b) Let X(s)=L{x(t)}, Determine the initial value, x(0) and the final value, x(∞), for the following signal using initial value and final value theorems. X(s) = 7s+6 / (s(3s+5))	5M 5M	CO3	L3 L2
17	Determine the following functions. Given, $x(t) = Asin(wt + \emptyset)$ (a) Auto correlation (b)Power spectral density	5M 5M	CO4	L3
	OR			
18	(a) State and prove any two properties of auto correlation function (b)Prove that for a signal, auto correlation and PSD form a Fourier transform pair.	5M 5M	CO4	L3
19	Illustrate the conditions for distortion less transmission through a system.	10M	CO5	L2
	OR			
20	(a) Describe filter characteristics of a linear system. (b) Explain state space model	5M 5M	CO5	L2