Question Paper Code: R22A31EE03

R22

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech I Semester Regular Examinations, December – 2024

SIGNALS AND SYSTEMS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max. Marks: 60**

Section – A (Short Answer type questions) (10 Marks)

Answer All Questions		Course Outcome	B.T Level	Marks
1.	Define Step function	CO1	L1	1M
2.	State the linearity property of the system	CO1	L1	1M
3.	What is the state-space representation of a system?	CO2	L1	1M
4.	Define causality in an LTI system.	CO2	L1	1M
5.	What is limitation of Fourier series.	CO3	L1	1M
6.	Difference between DTFT and DFT	CO3	L1	1M
7.	Find the Laplace Transform of impulse function.	CO4	L2	1M
8.	What are the advantage of Z transform.	CO4	L1	1M
9.	When does aliasing occur? How can it be avoided?	CO5	L1	1M
10.	What is Nyquist interval.	CO5	L1	1M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	State whether the following system is linear, causal, time invariant and stable a) $y(n) = nx(n)+x(n+2)+y(n-2)$ b) $y(n) = 2x(n+1)+[x(n-1)]^2$	CO1	L3	10M
	OR			
B)	Explain the properties of continuous and discrete signals with respect to periodicity, absolute integrability, determinism with example	CO1	L2	10M
12. A)	Construct a state model for a system characterized by the differential equation, $\frac{d^3y(t)}{dt^3} + 6\frac{d^2y(t)}{dt^2} + 11\frac{dy(t)}{dt} + 6y(t) + u(t) = 0$ Also give the block diagram representation of the state model.	CO2	L2	10M
	OR			
B)	Consider a stable LTI system by the differential equation $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3\,y(t) = \frac{dx(t)}{dt} + 2\,x(t)$ Find its response for input $x(t)=e^{-t}u(t)$	CO2	L3	10M
13. A)	Derive the Fourier transform of a rectangular pulse of width τ and amplitude A. Discuss the resulting magnitude and phase spectrum.	CO3	L2	10M
	OR			
B)	State Parseval's theorem for the DTFT and the DFT.	CO3	L2	10M

14. A)	Find the impulse and step response for the system $H(s) = \frac{5}{s^2+4s+5}$	CO4	L3	10M
	OR			
B)	Find the Z Transform of following Sequences *i)*$u(n)- u(n-4)$ ii) $u(-n) - u(-n-3)$ iii) $u(2-n)- u(-2-n)$	CO4	L3	10M
15. A)	Find the Nyquist rate and the Nyquist interval for the following signals i)$x(t) = -10\sin 40\pi t \cos 300\pi t$ ii) $x(t) = \text{rect}(300t)$ iii) $x(t)= \text{sinc}(100\pi t)+\text{sinc}(400\pi t)$	CO5	L3	10M
	OR			
B)	State and prove the sampling theorem for low pass signals.	CO5	L2	10M