

Reg.No.:

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 70054

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2025

Fourth Semester

Biomedical and Engineering

U19EC419 – SIGNALS AND SYSTEMS

(Regulation 2019)

Time : Three Hours

Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

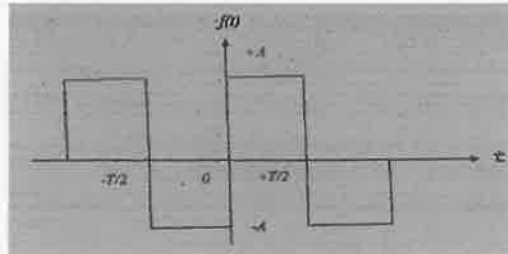
(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define the periodicity of $\cos(0.01\pi n)$.	2	K3	CO1
2.	Find whether the system described by $y(n) = nx(n)$ is time invariant or not.	2	K4	CO1
3.	Give the mathematical expressions of fourier series.	2	K1	CO2
4.	State the relationship between Fourier Transform and Laplace Transform.	2	K3	CO2
5.	Given the differential equation representation of the system $d^2y(t)/dt^2 + 2dy(t)/dt - 3y(t) = 2x(t)$. Find the frequency response.	2	K2	CO3
6.	List the properties of ROC in Laplace Transform.	2	K1	CO3
7.	State the need for sampling.	2	K3	CO4
8.	Find the Z-transformation of the signal and its associated ROC $x\{n\} = \{2, -1, 3, 0, 2\}$	2	K2	CO4
9.	What are the advantages of state space model over that of transfer function model?	2	K3	CO5
10.	Realize the following system using direct form-II method $y(n) - 0.5y(n-1) = x(n) + 0.5x(n-1)$	2	K4	CO5

PART – B

(5 x 13 = 65 Marks)

Q. No.	Questions	Marks	KL	CO
11.	<p>a) i. Draw the wave forms represented by the following step functions $f_1(t) = 2 u(t-1)$ & $f_2(t) = -2 u(t-1)$ a. $f(t) = f_1(t) + f_2(t)$ b. $f(t) = f_1(t) - f_2(t)$.</p> <p>ii. Determine the Energy and power of the given signal $x(t) = t u(t)$.</p> <p>iii. Find whether the following signal is periodic or not. If periodic determine the fundamental period: $(t) = 3 \cos t + 4 \cos(t/3)$.</p>	5	K3	CO1
	(OR)			
	b) A continuous time system has the input-output relation given by $y(t) = t x(t-1)$ Determine whether the system is		K3	CO1
	i. Linear	3		
	ii. Time invariant	3		
	iii. Causal	3		
	iv. Stable	2		
	v. Memory less	2		
12.	a) Find the exponential Fourier series representation of the signal.	13	K3	CO2



(OR)

	b) i. Find the Inverse Fourier transform of $X(\omega) = \frac{2j\omega+1}{(j\omega+2)^2}$	7	K3	CO2
	ii. Find the Laplace transform of the function $x(t) = e^{-2t} u(t) + e^{-3t} u(t)$.	6		
13.	a) Compute the convolution of the given signals			
	i. $x(t) = \cos t u(t)$, $h(t) = u(t)$.	7	K4	CO3
	ii. $x(t) = u(t)$, $h(t) = \frac{R}{L} e^{-tR/L} u(t)$.	6		

(OR)

b)	Determine the impulse response and step response of the system	13	K3	CO3
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$$H(s) = \frac{s+4}{(s^2+5s+6)}$$

14. a) State and prove the sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its sample. 13 K3 CO4
- (OR)
- b) Find the inverse Z-Transform of 13 K3 CO4
- $$X(z) = \frac{z^2}{(z-0.5)(z-1)^2} \quad \text{ROC } |z| > 1.$$
15. a) Compute the response of the system 13 K4 CO5
- $$y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n-1) + x(n-2)$$
- to the input $x(n) = n u(n)$. Comment on the stability of the system.
- (OR)
- b) Construct a state model for a system characterized by 13 K3 CO5
- differential equation
- $$\left(\frac{d^3y}{dt^3}\right) + 6\left(\frac{d^2y}{dt^2}\right) + 11\frac{dy}{dt} + 6y + u = 0.$$

PART – C

(1 x 15 = 15Marks)

- | Q. No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 16. a) | A system is described by the differential equation
$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + x(t).$ Find the transfer function and the output signal $y(t)$ for $x(t) = \delta(t)$. | 15 | K3 | CO3 |
| (OR) | | | | |
| b) | Formulate the Z transform and prepare the pole zero plots with ROC for each of the following signals.
(i) $x(n) = (0.5)^n u(n) - (1/3)^n u(n)$.
(ii) $x(n) = (1/2)^n u(n) + (1/3)^n u(n-1)$. | 15 | K4 | CO5 |