Reg.No.:												

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

Question Paper Code: 70045

B.E./B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026
Fourth Semester
Biomedical 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.	Distinguish between energy and power signals.	2	K2	CO1
2.	Determine whether the given system is causal and stable: $y(n) = 3x(n-2) + 3\,x(n+2)$.	2	K2	CO1
3.	What is the difference between Fourier series and Fourier transform?	2	K2	CO2
4.	Find the Laplace Transform of $x(t) = te^{-(-2t)}u(t)$.	2	K2	CO2
5.	Define the transfer function of a continuous-time system.	2	K2	CO3
6.	Draw the block diagram of the given system described by: $\frac{dy(t)}{dt} + y(t) = 0.1x(t)$.	2	K2	CO3
7.	What is an anti –aliasing filter?	2	K1	CO4
8.	Find the Z-transform of $a^n u(n)$.	2	K2	CO4
9.	What are the advantages of the state-space model over transfer function model?	2	K2	CO5
10.	Determine the transfer function of the system described by $y(n) = ay(n-1) + x(n)$.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q. No.			Questions	Marks	KL	CO
11.	a)	i.	Explain elementary continuous-time signals in detail.	7	K3	CO1
		ii.	Predict whether the following signals are periodic or not. a. $x(t) = 2\cos(10t + 1) - \sin(4t - 1)$ b. $x(t) = u(t) - u(t - 10)$	6		
			(OR)			
	b)	i.	Analyze whether the following systems are linear or not. a. $y(t) = e^{x(t)}$ b. $y(t) = t^2x(t)$	8	K3	CO1
		ii.	Examine whether the following systems are time invariant or not. a. $y(n) = x(-n)$ b. $y(n) = x(n + 1) + x(n) + x(n - 1)$	5		
12.	a)	i.	Find the Fourier transform of $x(t) = e^{-at} u(-t)$.	6	K3	CO2
		ii.	Determine the Fourier series representation of $x(t) = 2+\cos(4t) + \sin(6t)$.	7		
			(OR)			
	b)		Analyze the inverse Laplace transform $X(s) = \frac{4}{(s+2)(s+4)}$ with reference to the following ROCs. i. $Re(s) < -4$ ii. $Re(s) > -2$ iii. $-2 > Re(s) > -4$.	13	K3	CO2
13.	a)		Examine the convolution of following signals. $x(t) = u(t)$ and $h(t) = u(t)\, u(t-2)$.	13	K3	CO3
			(OR)			
	b)		For an input $x(t) = e^{-2t} u(t)$, the system produces the output $y(t) = e^{-t} (t)$. Estimate its frequency response and impulse response.	13	K3	CO3
14.	a)	i.	Determine the Nyquist rate and the Nyquist interval for the signal $x(t)=1/\pi [\cos(5000 \pi t) \cos (2000\pi t)]$.	9	K3	CO4
		ii.	State and prove Parseval's theorem for the DTFT.	4		
			(OR)			
	b)	i.	Determine the Z transform and ROC of $x(n) = u(-n) - u(n-3)$.	7	K3	CO4
		ii.	Relate DTFT and Z transform with necessary explanations.	6		

15.	a)	i.	Determine the impulse response of the discrete time system described by the difference equation: $y(n-2) - 3y(n-1) + 2y(n) = x(n-1)$.	8	K3	CO5
		ii.	Find the linear convolution of $x(n)=\{1, 2, 3, 4, 5, 6, 7\}$ with $h(n)=\{2, 4, 6, 8\}$.	5		
			(OR)			
	b)		Find the impulse response, frequency response, magnitude response and phase response of the second order system $y(n) - y(n-1) + 3/16y(n-2) = x(n) - 1/2\ x(n-1)$.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q. No.		Questions	Marks	KL	CO
16.	a)	A system is described by a given differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + x(t)$ Evaluate its transfer function and determine the output, $y(t)$ for $x(t) = \delta(t)$.	15	K4	CO3
		(OR)			
	b)	Compose the inverse Z-transform of the given function, $X(Z) = \frac{1 + 2z^{-1}}{1 - 2z^{-1} + z^{-2}}$ When (i) x(n) is causal (ii) x(n) is anti causal	15	K4	CO4