Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL/MAY 2026

Fourth Semester

Biomedical Engineering

UBMTL24401 - SIGNAL PROCESSING

Regulations - 2024

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BTL*	*CO*	*Marks*
1.	Define Linearity of a system.	L1	1	2
2.	Relate Quantization and sampling techniques.	L1	1	2
3.	Define Region of Convergence.	L1	2	2
4.	List any two properties of Z transform with proof.	L1	2	2
5.	Relate convolution and correlation.	L1	3	2
6.	Compare Decimation in time and Decimation in frequency with respect to twiddle factor.	L2	3	2
7.	What is the formula to find the Order of the filter using Butterworth filter?	L2	4	2
8.	Show impulse invariance method and bilinear transformation method of designing the digital filter.	L2	4	2
9.	Summarize Hamming, Hanning and Blackmann Turkey window functions.	L2	5	2
10.	Recall Multirate signal Processing.	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Name the following systems as static or not, linear or not, causal or not and time invariant or not . i) $\frac{d^3y(t)}{dt^3}+2\frac{d^2y(t)}{dt^2}+4\frac{dy(t)}{dt}+3y^2(t)=x(t+1)$ ii) $\frac{d^2y(t)}{dt^2}+2y(t)\frac{dy(t)}{dt}+3ty(t)=x(t)$	L3	1	10
		ii	Relate Amplitude scaling, frequency scaling and folding operations of signals with an example.	L2	1	6
			Or			
	b	i	Describe the concept of quantization and quantization error.	L2	1	6
		ii	Show the importance of Nyquist rate in sampling and reconstruction of signals.	L2	1	10

12.	a	i	Determine the pole-zero plot for the system described by the difference equation y(n)-(3/4)y(n-1)+(1/8)y(n-2) = x(n)-x(n-1).	L3	2	8
		ii	State and prove convolution and Parseval's theorem using Z transform.	L3	2	8
			Or			
	b		List the properties of DTFT with proof.	L3	2	16
13.	a		Construct the circular convolution of two finite duration sequences: $x_1(n)$ = {1, −1, −2,3, −1}; $x_2(n)$ = {1,2,3}.	L3	3	16
			Or			
	b		Apply DIT algorithm to compute DFT of the given sequence: x(n) = {1, 1, 1, 1, 0, 0, 0, 0}	L3	3	16
14.	a		Analyze a digital Chebyshev filter to satisfy the constraints: 0.707 ≤ $\|H(e^{j\omega})\|$≤ 1 ; 0 ≤ ω ≤ 0.2π $\|H(e\ j\omega)\|$≤ 0.1 0.5π ≤ ω ≤ π using Bilinear transformation and assume T = 1sec.	L4	4	16
			Or			
	b		Examine the direct form I, direct form II, cascade and parallel form realization of LTI system governed by the equation: $y(n)$ = − 3/ 8 + $y(n-1)$ + 3/ 32 $y(n-2)$ + 1 /64 $y(n-3)$ + $x(n)$ + 3 $x(n-1)$ + 2 $x(n-2)$.	L4	4	16
15.	a		Construct the design of FIR filter with the following desired specifications using hanning window with N=5. $H_d(e^{j\omega})$ = { 0 for − π /4 ≤ $\|\omega\|$ ≤ π/ 4 $e^{-j2\omega}$ for π /4 ≤ $\|\omega\|$ ≤ π}	L3	5	16
			Or			
	b		With neat sketch explain the architecture of TMS320C54x processor.	L3	5	16