Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Fourth Semester

Electronics and Communication Engineering

EC3492 - Digital Signal Processing

Regulations - 2021

Duration : 3 Hrs ***Maximum : 100 Marks***

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	State Sampling Theorem.	L1	1	2
2.	Given a continuous-time signal x(t) that is band-limited to 6 kHz, if it is sampled in the time domain at a rate of 15 kHz, what is the corresponding frequency-domain sampling interval.	L2	1	2
3.	What is meant by the impulse invariance method for designing IIR filters?	L2	2	2
4.	What are advantages of bilinear transformation?	L1	2	2
5.	Distinguish between symmetric and anti-symmetric FIR filters.	L2	3	2
6.	Outline the steps involved in the Fourier series method used to design FIR filters.	L1	3	2
7.	Compare fixed-point and floating-point number representations.	L2	4	2
8.	How does scaling help in preventing overflow?	L2	4	2
9.	Define decimation in multirate signal processing.	L1	5	2
10.	List two applications of adaptive filtering.	L1	5	2

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

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Find the circular convolution of the two sequences x_1 (n) = $[1,2,3,1]$ and x_2 (n) =$[4,3,2,2]$ by using concentric circle method.	L3	1	8
		ii	Determine the output response y(n) if h(n) = $[1,1,1]$ and x(n) =$[1,2,3,1]$ by using Linear Convolution.	L3	1	8
			Or			
	b		Find the output y(n) of a filter whose impulse response is h(n) = $[1,1,1]$ and input signal x(n) = $[3,-1,0,1,3,2,0,1,2,1]$ using overlap-save method and overlap -add method.	L3	1	16
12.	a	i	Given the specifications α_p=3 dB, α_s=16 dB, f_p=1 KHZ and f_s=2 KHZ. Determine the order of the filter using Chebyshev approximation and Find H(s).	L3	2	8
		ii	Design a high-pass filter for the given specification α_p=3 dB, α_s=15 dB, Ω_p=1000 rad/sec and Ω_s=500 rad/sec.	L3	2	8

Or

	b	i	Obtain the Direct Form -I realization for the system described by different by difference equation y(n)= 0.5y(n-1) - 0.25y(n-2) + x(n) + 0.4x(n-1).	L3	2	8
		ii	Realize the system with difference equation y(n) = $\frac{3}{4}$ y(n-1) – $\frac{1}{8}$ y(n-2) + x(n) + $\frac{1}{3}$ x(n-1) in cascade form.	L3	2	8
13.	a		Design a filter using Rectangular Window $H_d\ (e^{i\omega}$) = 1 for $\frac{\pi}{4} \leq \lvert\omega\rvert \leq \pi$ = 0 for $\lvert\omega\rvert \leq \frac{\pi}{4}$?	L4	3	16
			Or			
	b		Determine the direct form realization of the system function, H(z) = 1+ $3Z^{-1} - 4Z^{-2} - 4Z^{-3}$+ $6Z^{-4}$ + $5Z^{-5}$?	L4	3	16
14.	a		Explain coefficient quantization error and product quantization error in detail.	L2	4	16
			Or			
	b		Explain limit cycle oscillations caused by product quantization and summation.	L2	4	16
15.	a		Discuss about sampling rate conversion by a rational factor.	L2	5	16
			Or			
	b		Discuss the DSP architecture in detail.	L2	5	16