Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL/MAY 2026

Fourth Semester

Electronics and Communication Engineering

UECTL24402 –Digital 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.	Differentiate DIT radix-2 FFT and DIF radix-2 FFT.	L3	1	2
2.	List the properties of DFT.	L2	1	2
3.	Draw the direct form–II structure of IIR filter.	L3	2	2
4.	Obtain the transfer function for a normalized butterworth filter of order 2.	L2	2	2
5.	What is frequency sampling method?	L1	3	2
6.	Define anti-symmetric FIR filter.	L1	3	2
7.	A signal is quantized using a 10-bit ADC with range 0–5V. Find: (a) Step size (b) Maximum quantization error	L3	4	2
8.	A system uses uniform quantization with step size Δ = 0.01. Find quantization noise power.	L4	4	2
9.	Define equalization.	L1	5	2
10.	A signal sampled at 10 kHz is decimated by factor 2. Find new sampling frequency.	L4	5	2

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

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a		Compute 8 – point DFT of the sequence x(n) = {0, 1, 2, 3, 4,5, 6, 7} using radix – 2 DIT algorithm.	L3	1	16
			Or			
11.	b	i	Determine the output y(n) of a filter whose impulse response h(n) = {1,2} and input signal x(n) = {1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1} using overlap save method and overlap add method.	L3	1	8
		ii	Find circular convolution of the sequences using concentric circle method x1={2,1,2,1} and x2={1,2,3,4}.	L3	1	8
12.	a		Design a Butterworth filter using the Impulse invariance method for the following specifications. $0.8 \le \lvert He^{jw} \rvert \le 1 \quad 0 \le w \le 0.2\pi$ $\lvert He^{jw} \rvert \le 0.2 \quad 0.6\pi \le w \le \pi$ Realize the designed filter using direct form II structure.	L4	2	16
			Or			
12.	b	i	If H(S)= 1/(S+1)(S+2), Find H(z) using Impulse Invariant Method for sampling frequency of 5 samples/sec.	L4	2	8
		ii	Realize the given transfer function $H(Z)=(4Z^2+11Z-2)/(Z+1)(Z-3)$ using Direct Form-II and Parallel structure.	L4	2	8

13.	a	i	Design a High pass filter using Hamming window with a cut-off frequency of 1.2 radians/sec and N=9.	L4	3	8
		ii	Summarize the factors that decide the choice of window in FIR filter design using window techniques. Also compare the merits and demerits of windowing techniques.	L2	3	8
			Or			
13.	b		Design an ideal high pass filter using Hanning window with the specification N=11 of the system. $H_d(e^{jw}) = \begin{cases} 1 & \frac{\pi}{4} \le \lvert w \rvert < \pi \\ 0 & \lvert w \rvert \le \frac{\pi}{4} \end{cases}$	L4	3	16
14.	a	i	Convert the number -25.375 into: (a) Fixed point representation (b) Floating point representation	L3	4	8
		ii	Explain limit cycle oscillations in IIR filters with numerical example.	L2	4	8
			Or			
14.	b	i	A system output exceeds limit ±1 due to gain of 4. (a) Explain overflow condition (b) Determine scaling factor (c) Apply scaling and show result	L3	4	8
		ii	Determine scaling factor required to avoid overflow in a system with gain = 5.	L3	4	8
15.	a		A signal sampled at 24 kHz is decimated by factor 3. (a) Find new sampling frequency (b) Explain aliasing effect (c) Design anti-aliasing filter	L4	5	16
			Or			
15.	b		Explain the TMS320C50X architecture with its neat block diagram.	L4	5	16