R22 Regulation *Subject code: 4E5BC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, May 2025

DIGITAL SIGNAL PROCESSING

(EEE)

Maximum Marks: 60 Date: 24.06.2025 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	What are the advantages of digital signal processing	1M	1	L2
b)	Define impulse function in terms of step function	1M	1	L2
c)	What is the time shifting property of Discrete Fourier transform	1M	2	L1
d)	What is the advantage of FFT over DFT	1M	2	L2
e)	Compare Butterworth and Chebyshev digital filters	1M	3	L2
f)	What are the drawback of impulse invariant technique	1M	3	L1
g)	What are the different realization techniques FIR digital filters	1M	4	L2
h)	What is the advantage of FIR filter over IIR filter	1M	4	L2
i)	Define multirate signal processing	1M	5	L1
j)	What is the output of up sampler for a sequence x(n)={2,5,4,6} with up sampling factor of 3	1M	5	L2

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Find the Natural response of the system described by the difference equation y(n)- 4y(n-1)+4y(n-2) = x(n)-x(n-1) with initial conditions y(-1) = y(-2) =1	10M	1	L5
	OR			
3	Check for following systems are linear, causal, time in variant, stable, static i)y(n) = x(n) cos (x(n) ii) y(n) =x(n) +n x (n+1)	5M 5M	1	L4
4	Perform linear convolution for the input x(n) = [1,2,2,0,3,4,1,2,2,1] and Impulse response h(n)=[2,1,1] ,using Overlap save method.	10M	2	L4
	OR			
5	Find the Eight-point DFT of the sequence X(K) = [3,3,3,3,3,3,3,3] using radix-2 DIT-FFT algorithm.	10M	2	L5
6	Convert the analog filter H(s) = 0.5 (s+4) / (s+1)(s+2) using impulse invariant transformation Consider T=0.31416 s	10M	3	L4

	OR			
7	Design a Butterworth filter that satisfy the Constraints $0.707 \leq \lvert H(e^{j\omega}) \rvert \leq 1$ for $0 \leq \omega \leq 0.2\pi$ $0 \leq \lvert H(e^{j\omega}) \rvert \leq 0.2$ for $0.6\pi \leq \omega \leq \pi$ Using Bilinear transformation and assume sampling period T=1sec.	10M	3	L5
8	Design a filter using Hamming window with the given specification of the system $Hd(e^{jw}) = e^{-j3w}$, $-\pi/4 \leq \lvert\omega\rvert \leq \pi/4$ $= 0$ $\pi/4 \leq \lvert \omega \rvert \leq \pi$ Consider N=7	10M	4	L5
	OR			
9	Explain about various windows technique.	10M	4	L5
10	Derive the expression for the response of the output of down sampler with necessary equations and draw the output spectrum.	10M	5	L4
	OR			
11	a) Explain about zero input limit cycle oscillation b) How can overflow limit cycles be eliminated?	5M 5M	5	L2