R22 Regulation *Subject code:4E6DB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Regular/Supplementary Examinations, April 2026

DIGITAL SIGNAL PROCESSING

(ECE)

Maximum Marks: 60 Date:16.04.2026 Duration: 3 hours

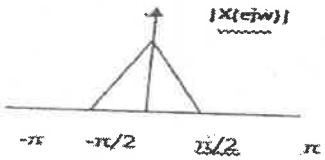
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	When is a discrete-time signal periodic?	1M	1	1
b)	What are the properties of ROC in Z Transform?	1M	1	1
c)	What is linear convolution?	1M	2	1
d)	Define FFT and IFFT.	1M	2	1
e)	What is the main characteristic of a Butterworth filter?	1M	3	1
f)	Mention the requirements for analog filter to be stable.	1M	3	1
g)	What is the objective of the windowing technique?	1M	4	1
h)	List commonly used window functions.	1M	4	1
i)	What is the formula for a down sampled signal?	1M	5	1
j)	What is up sampling?	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) Draw the block diagram of DSP and explain about each block in detail. b) Explain the relationship between DTFT and Z transform.	6M 4M	1 1	2 2
	OR			
3	Find Z Transform of the following signals and plot its ROC a) $x(n) = \{1,-2,2,3\}$ b) $x(n) = -n$ for $-3 \le n \le 3$	5M 5M	1	3
4	Find 8-point DFT of $x(n) = 0.5,\ 0 \le n \le 3$ $0,\ 4 \le n \le 7$ using DIF FFT.	10M	2	4
	OR			
5	a) Obtain the circular convolution of $x_1(n) = \{0,1,0,2,1,1\}$ and $x_2(n) = \{-1,1,2,-3,-1,2\}$ b) Compare DFT and FFT.	6M 4M	2	4
6	Design a Butterworth low pass filter for the specifications given below: a)-3 dB cut off frequency of 100 rad/sec. b)-25 dB cutoff frequency of 250 rad/sec.	5M 5M	3	4

	OR			
7	Find the digital filter H(z) from given analog filter below using impulse invariant method H(S) = 1 / (S+1) (S+2)	10M	3	3
8	Design an ideal HPF using Hamming window for N=9 whose desired frequency response is $H_d(e^{jw}) = 1, \ \pi \geq w \geq \pi/3$ 0, otherwise	10M	4	4
	OR			
9	Design a Filter using Blackman window for N=7 with $H_d(e^{jw}) = e^{-j3w}$ for $-\pi/4 \leq w \leq \pi/4$ 0 for $\pi/4 \leq w \leq \pi$	10M	4	4
10	a) Draw the spectrum of Down sampled signal for the sampling rate factor D=2 and D = 3  b) Explain about up sampling and down sampling.	5M 5M	5 5	3 2
	OR			
11	Write short notes on a) Decimation b) Interpolation	5M 5M	5	2