



R22 Regulation

Subject code: 4E6DB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Regular Examinations, May 2025

DIGITAL SIGNAL PROCESSING

(ECE)

Maximum Marks: 60

Date: 18.06.2025

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)	Define ROC in Z-transform.	1M	CO1	L1
b)	State the conditions for a discrete-time system to be linear and time-invariant (LTI).	1M	CO1	L2
c)	Explain the need for zero-padding in DFT computations.	1M	CO2	L1
d)	List two differences between decimation-in-time and decimation-in-frequency FFT algorithms.	1M	CO2	L2
e)	Compare between Butterworth and Chebyshev filters.	1M	CO3	L2
f)	How does bilinear transformation avoid aliasing in IIR filter design?	1M	CO3	L2
g)	Compare rectangular and Hamming windows in FIR filter design.	1M	CO4	L2
h)	State the condition of linear phase FIR filters.	1M	CO4	L2
i)	What is the Nyquist criterion for sampling rate converters in multirate systems?	1M	CO5	L1
j)	List the applications of TMS320C54XX processor.	1M	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Given the difference equation for $y[n]-0.6y[n-1]=x[n]$, Find the transfer function $H(z)$ and ROC. Determine the impulse response $h[n]$.	10M	CO1	L3
OR				
3	Given $H(z) = \frac{1-z^{-1}}{1-0.25z^{-2}}$ Identify poles/zeros and sketch ROC and Determine if the system is stable and causal.	10M	CO1	L3
4	Compute the 4-point DFT of $x[n]=\{1,0,2,1\}$.	10M	CO2	L3
OR				
5	Draw the complete signal flow graph for an 8-point DIT-FFT and label all twiddle factors.	10M	CO2	L3

6	Design a Butterworth LPF with: Passband edge: 1 kHz, Stopband edge: 2 kHz, Passband ripple: ≤ 1 dB, Stopband attenuation: ≥ 20 dB Find the filter order, cutoff frequency and H(S).	10M	CO3	L3
OR				
7	A). Explain the bilinear transform method for IIR filter design. B) Compare between FIR and IIR Filter.	5M 5M	CO3	L2
8	Design an FIR filter using the rectangular window for a cutoff frequency $\omega_c = \pi/2$, $N=5$.	10M	CO4	L3
OR				
9	Explain how to ensure Fourier series method in FIR filter.	10M	CO4	L3
10	A signal is up sampled by 3 followed by down sampling by 2. Sketch the block diagram and output if input is $x[n] = \{1, 2, 3\}$.	10M	CO5	L3
OR				
11	Discuss the architecture of TMS320C54XX DSP processor.	10M	CO5	L2