R20 Regulation *Subject code: 3P6DC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, November 2025

DIGITAL SIGNAL PROCESSING

(ECE)

Maximum Marks: 70 Date: 11.11.2025 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 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 (10X2M=20 Marks)		Marks	CO	BTL
1	What is region of convergence (ROC)?	2M	1	L1
2	Predict whether the given signal y(n)=nx(n) is time invariance or not	2M	1	L1
3	What is meant by zero padding?	2M	2	L1
4	Draw the basic butterfly diagram of DIT algorithm	2M	2	L1
5	Give any two properties of Butterworth lowpass filter	2M	3	L1
6	Write the bilinear transform equation between s-plane and z-plane.	2M	3	L1
7	Define Phase delay.	2M	4	L1
8	What are the desirable characteristics of the window?	2M	4	L1
9	Define interpolation process.	2M	5	L1
10	Write basic architectural features of Digital signal processors.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	a) Explain in detail about the block diagram of DSP and its applications. b) Determine the frequency response and calculate the magnitude response and phase response for the system y(n)=x(n)+0.9x(n-2)-0.4y(n-2).Also plot the responses.	5M 5M	1	L2
	OR			
12	Solve the z-transform and ROC of the following sequences a) $x[n]=[4(5^n)-3(4^n)]\,u(n)$ b) $(1/3)^n\,[u(n)-u(n-8)]$	5M 5M	1	L2
13	State and prove the periodicity property and time shifting property of DFT.	10M	2	L2
	OR			
14	Implement the Decimation in frequency FFT algorithm for $x(n) = (-1)^n$ for N=8 and build the signal flow graph. Show all the intermediate results on the signal flow graph.	10M	2	L2
15	a) Determine the Direct form II realization for the following system y(n)=-0.1y(n-1)+0.72y(n-2)+0.7x(n)-0.252x(n-2). b) Design Chebyshev low pass filter with the given specifications	4M 6M	3	L2

	α_p =2.5dB, α_s =30dB at Ω_p=20 rad/sec, Ω_s=50 rad/sec.			
	OR			
16	Design of IIR digital filter from analog filter using impulse invariant technique.	10M	3	L2
17	Design of FIR filter using Fourier series method.	10M	4	L2
	OR			
18	Design an ideal low pass filter whose frequency response $H_d(e^{j\omega})$ =1 for $-\pi/2 \leq \omega \leq \pi/2$ =0 for $\pi/2 \leq \omega \leq \pi$. Find the values of h(n) for N=11. Find H(z) using Hamming Window.	10M	4	L2
19	Analyze the Instruction set of TMS320C54XX Digital signal processors.	10M	5	L2
	OR			
20	Relate the process of Interpolation and Decimation in multirate signal processing also plot and derive their respective spectrums.	10M	5	L2