

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

III B.Tech II Semester Regular/supplementary Examinations, April – 2024

**DIGITAL SIGNAL PROCESSING
(ECE)**

Time: 3 hours

Max. Marks: 70 M

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) Test the linearity, time invariance and causality for the given system $y(n) = n x(n)^2 + 3x(n^2-1) + n.x(n+2)$	K3	CO1	7M
	b) Determine the frequency response of a given system: $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$.	K3	CO1	7M
OR				
2.	a) Given the linear shift time invariant system specified by the following difference equation $y(n) + 12y(n-1) = x(n) - 12x(n-1)$, $n \geq 0$ Find the frequency response of the system	K3	CO1	7M
	b) Determine whether $y(n) = \log_e(n)$ is causal, linear, dynamic, time invariant and stable.	K3	CO1	7M
UNIT – II				
3.	a) Compute the DFT of the sequence $x(n) = [1, 2, 3, 4, 4, 3, 2, 1]$, where $N=8$ using DIT FFT algorithm	K3	CO2	7M
	b) State and prove time convolution and frequency shifting properties of a DFT.	K2	CO2	7M
OR				
4.	a) Find the $y(n)$ for the sequences $x(n) = \{1, -1, 1, 2, 1, 0, 1, -4, 3, 2, 1, 0, 1, 1\}$ and $h(n) = \{1, 1, 2, 1\}$ using overlap-save method.	K3	CO2	7M
	b) Find 4-point DFT of a given sequence $x(n) = [1, 2, 3, 4]$	K3	CO2	7 M
UNIT – III				
5.	a) Design a digital Butterworth low pass filter that will meet the following specifications using Bilinear transformation i) Maximum pass band attenuation = 2dB ii) Passband edge frequency = 100rad/sec iii) Minimum stopband attenuation=20dB iv) Stop band edge frequency = 200 rad/sec	K3	CO3	7M
	b) i) Compare analog and digital filters. ii) Compare Chebyshev type 1&2 filters	K2	CO3	7M
OR				
6.	a) Construct the Direct Form II realization of the system described by the difference equation $y(n) = 3/8 y(n-1) + 3/4 y(n-2) + x(n) + 2x(n-1)$.	K3	CO3	7M

	b)	Design a Chebyshev filter for the following specification using bilinear transformation and Impulse invariance method. $0.6 \leq H(e^{j\omega}) \leq 1$; $0 \leq \omega \leq 0.2\pi$ $ H(e^{j\omega}) \leq 0.3$; $0.6\pi \leq \omega \leq \pi$	K3	CO3	7M
UNIT – IV					
7.	a)	Design an ideal band pass filter with a frequency response $H_d(e^{j\omega}) = 1$ $\pi/4 \leq \omega \leq 3\pi/4$ $= 0$ otherwise Find the values of $h(n)$ for $N = 11$ and plot the frequency response.	K3	CO4	7M
	b)	Compare various windowing techniques.	K2	CO4	7M
OR					
8.	a)	Design a low pass FIR filter using frequency sampling technique having cutoff frequency of $\pi/2$ rad/sample. The filter should have linear phase 4 and length 17.	K3	CO4	7M
	b)	Enumerate the differences between IIR and FIR filters.	K2	CO4	7M
UNIT – V					
9.	a)	Explain Interpolation with the help of neat diagrams	K2	CO5	7M
	b)	What is aliasing effect? How it can be eliminated?	K2	CO5	7M
OR					
10	a)	What is multirate sampling? Explain the need of it.	K2	CO5	7M
	b)	With the help of neat block diagram explain I/D sampling.	K2	CO5	7M