PRESIDENCY UNIVERSITY

BENGALURU

Make Up Examinations – December 2025
Date: 26 – 12- 2025   **Time:** 9:30am – 12:30pm

School: SOE	**Program:** B.Tech
Course Code : ECE3002	**Course Name:** DIGITAL SIGNAL PROCESSING
Semester: MK	**Max Marks**:100 **Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	24	24	26	26	NA

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.   **10Q x 2M=20M**

1.	Using matrix method obtain the circular convolution of the sequences $x(n) = \{1, 2, -1, 1\}$ and $h(n) = \{2, 4, 6, 8\}$	2 Marks	L2	CO1
2.	Perform the linear convolution for the same sequence given in Ques.no:1	2 Marks	L2	CO1
3.	Draw the basic butterfly diagram of radix 2 DIF FFT method.	2 Marks	L2	CO2
4.	Calculate the multiplication reduction factor or percentage of saving , α in computing 1024 point DFT, is a radix-2 FFT algorithm	2 Marks	L3	CO2
5.	Find the digital transfer function $H(z)$ by using impulse invariant method for the analog transfer function $H(s) = 1/s+2$. Assume T=0.1sec	2 Marks	L2	CO3
6.	Give any two properties of Butterworth filter and Chebyshev filter.	2 Marks	L1	CO3
7.	Write the magnitude function of Butterworth filter. What is the effect of varying order of N on magnitude and phase response?	2 Marks	L1	CO3
8.	Write the linear phase condition for a FIR Filter.	2 Marks	L1	CO4
9.	Determine the transversal structure of the system function $H(z)=1+2z^{-1}-z^{-2}-3z^{-3}$	2 Marks	L2	CO4
10.	What are the desirable and undesirable features of FIR filter?	2 Marks	L1	CO4

Part B

Answer the Questions.   Total Marks 80M

11.	a.	Implement the linear convolution of given sequences x(n) = {1,2,3,-1,-2,-3,4,5,6} and h(n) ={2 , 1, -1} using the Overlap-Add method and compare the result with linear convolution.	10 Marks	L3	CO1
	b.	An analog signal x(t)=5sin(600πt)+4cos(800πt)+2sin(1200πt) a)Calculate the minimum sampling rate required to sample the signal without aliasing. b)Discuss the effects of sampling the signal at 1000 Hz and 400 Hz.	10 Marks	L3	CO1
		Or			
12.	a.	Obtain the convolution of the sequences x(n) = { 3, -1, 0 ,1 ,3 ,2, 0, 1, 2 , 1} and h(n) = {1 ,1 , 1} using Overlap save method and compare the result with Linear convolution.	10 Marks	L3	CO1
	b.	Compute the sequence x3(n) obtained from the circular convolution of x1(n)={1,2,2,1} and x2(n)={1,2,3,4} using the Discrete Fourier Transform and its inverse DFT.	10 Marks	L3	CO1

13.	a.	Compute the eight point DFT of the sequence x(n)= {1,1,1,1,1,1,1,0} using radix2 decimation in frequency. Follow exactly the corresponding signal flow graph and keep track of all the intermediate quantities by putting them on the diagram.	15 Marks	L3	CO2
	b.	Compute the IDFT of sequence X(K)= {10, -2+2j, -2, -2-2j} using Radix 2 - DIF algorithm.	5 Marks	L3	CO2
		Or			
14.	a.	Examine the 8-point DFT of the sequence x(n) = n; using DIT- FFT algorithm. Illustrate with a neat butterfly diagram	15 Marks	L3	CO2
	b.	Find the IDFT of the sequence X(K)= {3, -j,1, j} using Radix 2 -DIT algorithm.	5 Marks	L3	CO2

15.	a.	Draw the magnitude response of type I and II Chebyshev filter and obtain the steps for designing an analog Chebyshev filter.	10 Marks	L2	CO3
	b.	Using Impulse Invariant method find the transfer function of the digital filter for $H(s) = \dfrac{10}{S^2+7S+10}$ for T=0.2Sec.	10 Marks	L2	CO3
		Or			
16.	a.	Design and analyse a digital butter worth filter satisfying the constraints $0.707 \leq |H(\omega)| \leq 1 ;\qquad 0 \leq \omega \leq \dfrac{\pi}{2}$ $|H(\omega)| \leq 0.2 ;\qquad \dfrac{3\pi}{4} \leq \omega \leq \pi$ With T=1 sec using bilinear transformation .	20 Marks	L4	CO3

17.	a.	Design a low pass filter using rectangular window by taking 9 samples of w(n) and cut off frequency of 1.2 rad/sec and realise the same using suitable structure.	20 Mark	L3	CO4
		Or			
18.	a.	Design a high pass filter of length N=11 and cutoff frequency of 0.5Hz and Sampling rate of 2KHz using Hamming window and realise the same using suitable structure.	20 Marks	L3	CO4