Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 26-05-2025 **Time:** 01:00 pm – 04:00 pm

School: SOE	**Program:** B. Tech-EEE	
Course Code :EEE3014	**Course Name :** Digital Signal Processing Systems	
Semester: IV	**Max Marks:**100	**Weightage:** 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	14	14	36	36	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	The first five DFT coefficients of a sequence x[n] are X[0] = 20, X[1] = 5+j2, X[2] = 0, X[3] = 0.2+j0.4, X[4] = 0. Determine the remaining DFT coefficients.	**2 Marks**	**L1**	**CO1**
2	How will you perform linear convolution via circular convolution?	**2 Marks**	**L1**	**CO1**
3	Compare DIF and DIT FFT algorithms	**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**	**L1**	**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	State the properties of chebyshev (Type I)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	What are the merits and demerits of FIR filters?	**2 Marks**	**L1**	**CO4**
9	What are the desirable and undesirable features of FIR filter?	**2 Marks**	**L1**	**CO4**
10	Determine the transversal structure of the system function $H(z)=1+z^{-1}-3z^{-2}-4z^{-3}$	**2 Marks**	**L2**	**CO4**

Part B

Answer the Questions **Total 80 Marks.**

11.	**a.**	Given the sequences h(n)={1,1,1} and x(n)={1,2,3,4}, determine the output sequence y(n) using the concentric circular convolution method. Also obtain the linear convolution output for the same.	**10 marks**	**L2**	**CO1**
	b.	Compute the eight point DFT of the sequence x(n)= {1,1,1,1,0,0,0,0} 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.	**10 marks**	**L3**	**CO2**

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 8 point DFT of the sequences x(n)= n+1 ; $0 \leq n \leq 7$ Using DIT -FFT method with necessary flow diagrams	**10 Marks**	**L3**	**CO2**

13.	**a.**	Using Impulse Invariant method find the transfer function of the digital filter for $H(s) = \frac{10}{S^2+7S+10}$ for T=0.2Sec.	**10 Marks**	**L2**	**CO3**
	b.	Briefly explain the general architecture of Digital Signal Processor.	**10 Marks**	**L2**	**CO4**

Or

14.	**a.**	Realise the given difference equation $y(n) + \frac{3}{8}y(n-1) - \frac{3}{32}y(n-2) - \frac{1}{64}y(n-3) = x(n) + 3x(n-1) + 2x(n-2)$ Using Direct form I and Direct form II methods.	**10 Marks**	**L3**	**CO3**
	b.	Obtain direct form and cascade form realizations for the transfer function of the system given by $H(z) = (1 - 2z^{-1} - z^{-2})(1 + z^{-1} - z^{-2})$	**10 Marks**	**L3**	**CO4**

15.	**a.**	Design a digital low pass filter using Bilinear transformation to satisfy the following characteristics (i) Monotonic pass band and stop band ; (ii) -3dB cutoff at 0.5 π rad (iii) -15 dB at 0.7 π rad	**20 Marks**	**L4**	**CO3**

Or

16.	**a.**	Design and analyse a Digital Butterworth filter satisfying the constraints $0.8 \leq \lvert H(\omega)\rvert \leq 1$; $0 \leq \omega \leq 0.2\pi$ $\lvert H(\omega)\rvert \leq 0.2$; $0.6\pi \leq \omega \leq \pi$ using impulse invariance method.	**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 Marks**	**L3**	**CO4**

Or

18.	**a.**	Analyse and design the filter using suitable structure to pass the frequency in the range of 1 to 2 rad/sec using Hanning window. Given : $H_d(\omega) = e^{-j2\omega}$; $\omega c1 \leq \lvert\omega\rvert \leq \omega c2$ 0 ; Otherwise	**20 Marks**	**L4**	**CO4**