PVP 23

Code: 23EC3603

III B.Tech - II Semester - Regular Examinations – APRIL 2026

DIGITAL SIGNAL PROCESSING
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	What is the frequency response of an LTI system?	L1	CO1
1.b)	State the condition for causality of an LTI system based on H(Z).	L1	CO2
1.c)	What is circular time shifting property of DFT?	L1	CO3
1.d)	Define DFT and IDFT.	L1	CO3
1.e)	What are the applications of FFT?	L1	CO3
1.f)	Write the advantages of FFT over DFT.	L1	CO3
1.g)	Compare Butterworth and Chebyshev filters.	L2	CO4
1.h)	Write the relationship between s-plane and z-plane poles in Impulse Invariant Transformation method.	L1	CO4
1.i)	What are symmetric and anti-symmetric impulse responses?	L1	CO4
1.j)	What is cascade realization?	L1	CO5

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	For the system described by $y(n) - 0.7y(n-1) + 0.12y(n-2) = x(n)$. Determine the frequency response and discuss on stability.	L3	CO1	5 M
	b)	Derive the conditions for causality and stability of LTI systems.	L3	CO2	5 M
OR					
3		Determine the impulse response and step response of a system described by the following equation. $y(n) = 0.6y(n-1)-0.08y(n-2)+x(n)$.	L3	CO2	10 M
UNIT-II					
4		Perform linear convolution of a sequence $x(n)=\{12,13,-1,-2,-3,4,5,6\}$ and $h(n)=\{2,1,-1\}$ using over-lap save method and verify the result with over-lap add method.	L3	CO3	10 M
OR					
5	a)	Compute the circular convolution of the sequences $x_1(n) = \{1,2,0,1\}$ and $x_2(n) = \{2,2,1,1,\}$.	L3	CO3	5 M
	b)	Prove any Three properties of DFT.	L3	CO3	5 M

UNIT-III					
6	a)	Draw Radix-2 DIF FFT algorithm and explain its characteristics.	L3	CO3	5 M
	b)	Determine the DFT of the sequence x(n) = (2,2,2,2,1,1,1,1) using Radix-2 DIT FFT algorithm.	L3	CO3	5 M
OR					
7		Compute IDFT of the sequence X(K) = {7, -0.707-j0.707, -j, 0.707-j0.707, 1, 0.707+j0.707, j, -0.707+j0.707} using Radix-2 DIF FFT algorithm.	L3	CO3	10 M
UNIT-IV					
8		Design a Butterworth IIR low pass filter with the following specifications: pass band gain k_1 = -1 dB, stop band attenuation k_2 = -40 dB, pass band edge frequency is 2 KHz, stop band edge frequency 10 KHz, Sampling frequency is 25 KHz. Use the bilinear transformation technique.	L5	CO4	10 M
OR					
9		Describe the IIR filter design using Bilinear Transformation method. Also sketch the s-plane to z-plane pole mapping.	L3	CO4	10 M
UNIT-V					
10		Differentiate between IIR and FIR filters. Discuss the various steps in designing FIR filter using window method.	L4	CO4	10 M

		OR			
11	a)	Design an ideal LPF with the desired response $H_d(e^{j\omega}) = e^{-j5\omega}$; $\lvert\omega\rvert \leq \frac{\pi}{3}$ $= 0$; $\frac{\pi}{3} \leq \lvert\omega\rvert \leq \pi$ for N = 11 using Rectangular window.	L5	CO4	5 M
	b)	Realize a cascade and parallel realization for the system having difference equation y(n) + 0.1y(n-1) - 0.2y(n-2) = 3x(n) + 3.6x(n-1).	L3	CO5	5 M