U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

Branch: ES Cluster (EEE/ET/ECE/EIE/MD) **Duration: 3 hrs.**

Course Code: 22ES5PCDSP **Max Marks: 100**

Course: Digital Signal processing

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Find the 8 point DFT of x(n)={1,2,1,3,1,4,1,5}using direct implementation . Plot the magnitude and phase spectrum	*CO2*	*PO1*	**10**
	b)	(i) (ii)	Given x(n)= (1,2,3,4). Find the energy and hence verify Parseval's theorem. By means of circular convolution, determine the response of the FIR filter with impulse response h(n)= {4,1,3} to the input sequence x(n) ={2,4,0,4}.	*CO1*	*PO1*	**10**
			OR			
2	a)	(i) (ii)	Find the DFT of x(n)= {1,0,5,7} using matrix method Find the linear convolution of x1(n)={1,2,3,4} and x2(n)={5,6,7,8,9} using Circular convolution method	*CO2*	*PO1*	**10**
	b)		Find the IDFT of X(k)={36, -4+j9.6, -4+j4, -4+j1.65, -4, -4-j1.65, -4-j4, -4-j9.6}.	*CO2*	*PO1*	**10**
			UNIT - II			
3	a)		Find the convolution of x1(n)={1,3,5,7,9,8,7,6,5,4,3,2,1} and x2(n)={1,2} using overlap add method.	*CO2*	*PO1*	**10**
	b)		Find the DFT of x(n)={1,2,3,4,4,3,2,1} using DIT FFT algorithm	*CO2*	*PO1*	**10**
			OR			
4	a)		Find the convolution of x1(n)={1,3,5,7,9,8,7,6,5,4,3,2,1} and x2(n)={1,2} using overlap save method.	*CO2*	*PO1*	**10**
	b)		Find the DFT of x(n)={1,2,1,4,4,1,2,1} using DIF FFT algorithm	*CO2*	*PO1*	**10**
			UNIT - III			
5	a)		Derive the expression for the order of Butterworth Filter	*CO2*	*PO1*	**07**
	b)		Draw the direct form-I structure for the following difference equation y(n)-0.5y(n-1)+0.2y(n-2)=x(n)+2x(n-1)+2.5x(n-2)	*CO2*	*PO1*	**05**

		c)	Derive the expression for Digital filter conversion from analog filter using impulse invariant method. Also discuss the steps involved in digital filter design.	*CO2*	*PO1*	**08**
			OR			
	6	a)	List the expressions for Analog-to-Analog frequency transformations in filter design	*CO2*	*PO1*	**06**
		b)	Draw the direct form-II structure for the following difference equation y(n)-0.5y(n-1)+0.2y(n-2)=x(n)+2x(n-1)+2.5x(n-2)	*CO2*	*PO1*	**06**
		c)	Convert the analog bandpass filter with system function, $$H(s)=\frac{1}{(s+0.1)^2+9}$$ using bilinear transformation. Also describe the steps involved in digital filter design	*CO2*	*PO1*	**08**
			UNIT - IV			
	7	a)	Design a FIR low pass filter of length 7 with cut off frequency of $\frac{\pi}{2}$ rad/sec. Use hamming window.	*CO2*	*PO1*	**10**
		b)	Discuss the steps involved in designing the FIR filters using frequency sampling technique. Also draw the frequency sampling structure of FIR Filter.	*CO2*	*PO1*	**10**
			OR			
	8	a)	List the features of FIR filter.	*CO1*	-	**05**
		b)	With a relevant example , illustrate the linear phase structure of FIR filter.	*CO2*	*PO1*	**07**
		c)	Design a FIR digital filter using a rectangular window with length N=5 $$H_d(e^{j\omega})=\begin{cases} e^{-j2\omega}, & |\omega|<\frac{\pi}{4} \\ 0, & \frac{\pi}{4}<|\omega|<\pi \end{cases}$$	*CO2*	*PO1*	**08**
			UNIT - V			
	9	a)	With relevant equations explain the working of LMS Algorithm.	*CO2*	*PO1*	**10**
		b)	With relevant equations and diagrams describe the process of sampling rate conversion by rational factor I/D.	*CO2*	*PO1*	**10**
			OR			
	10	a)	What is an adaptive filter? Illustrate with neat block diagram. Describe the process of noise cancellation using adaptive filters.	*CO2*	*PO1*	**10**
		b)	With relevant equations and diagrams describe the process of (i) Decimation (ii) Interpolation	*CO2*	*PO1*	**10**

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