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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: Electronics and Communication Engineering **Duration: 3 hrs.**

Course Code: 23EC5PCDSP **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 4-point DFT of the sequence x(n)= {1,6,4,3} using matrix method.	CO1	PO 1	5
	b)	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 . Disclose the remaining DFT coefficients.	CO1	PO 1	5
	c)	Determine the circular convolution for the two sequences x1(n)={1,2,3,4}, x2(n)= {1,5,1,3} using concentric circles method	CO1	PO 1	10
		OR			
2	a)	Find the IDFT of a sequence X(k)= {2, 1+j, 0,1-j}	CO1	PO 1	5
	b)	Given x(n)= (1,2,0,3, -2,4,7,5). Evaluate the following (a) X (0) (b) X (4)	CO1	PO 1	5
	c)	Obtain the convolution of the sequence {2,1,2,1} and {1,2,3,4} by applying DFT and IDFT method.	CO1	PO 1	10
		UNIT - II			
3	a)	Determine eight point DFT of the following sequences using radix2 DIFFFT algorithm x(n)={1,-1,-1,-1,1,1,1,-1}	CO1	PO 1	10
	b)	Determine IDFT of X(K)={6,-2,-2j,2,-2+2j} using DIT algorithm	CO1	PO 1	10
		OR			
4	a)	Determine the response of LTI system when input x(n)= {-1,1,2,1} and impulse response h(n)={-1,1,-1,1] by Radix 2 DIT FFT algorithm	CO1	PO 1	10
	b)	Find the output y(n) of a filter whose impulse response is h(n)=[1,-1] and input x(n)= [1,-2,2,-1,3,- 4,4,-3] using overlap add method .	CO1	PO 1	10

			UNIT - III			
	5	a)	Using bilinear transformation design a lowpass filter monotonic in passband with -3.01 dB cutoff frequency of 0.4 π rad and magnitude down at least by 15 dB at 0.75 π rad.	***CO3***	***PO3***	**12**
		b)	Benchmark between FIR and IIR filters	***CO2***	***PO 2***	**8**
			OR			
	6	a)	Determine the digital transfer function H(z) for the analog transfer function H(s) = 1/ (s+2). Assume T=0.1 sec. (i) Bilinear transfer technique (ii) Impulse Invariant technique	***CO3***	***PO3***	**12**
		b)	Benchmark between Butterworth and Chebyshev filters	***CO2***	***PO 2***	**8**
			UNIT - IV			
	7	a)	Design a FIR filter for the ideal frequency response using Hamming window with N=7 $H_d^{(ej\omega)} = e^{j3\omega;}$ - π/8 <w< π/8 π/8<w< π	***CO3***	***PO3***	**12**
		b)	Realize following system with difference equation in cascade form y(n) = (3/4) y(n-1) – (1/8) y(n-2) + x(n) + (1/3) x(n-1)	***CO2***	***PO 2***	**8**
			OR			
	8	a)	Design a linear Phase FIR LPF of length 17 with a pass-band edge at ωp=0.5Π using the frequency sampling approach.	***CO2***	***PO 2***	**12**
		b)	Realize following system with difference equation in parallel form y(n)=0.75y(n-1)-0.125y(n-2)+3x(n)+7x(n-1)+x(n-2)	***CO1***	***PO1***	**8**
			UNIT - V			
	9	a)	A signal with a sampling rate of 44.1 kHz needs to be up sampled to 96 kHz. Design a multirate system to achieve this.	***CO1***	***PO1***	**8**
		b)	"Noise cancellation is one of the applications of adaptive filtering". If YES, discuss in detail.	***CO2***	***PO 2***	**12**
			OR			
	10	a) b)	Convert the sampling rate of a signal x(n) from 300 Hz to 500 Hz using a rational factor I/D=5/3 A signal x(n) is sampled at 1000 Hz. You need to process it at a lower rate of 250 Hz, then convert it back to 1000 Hz. Describe the steps involved.	***CO1***	***PO1***	**4** **4**
		c)	"Line enhancement is an application of adaptive filtering". Discuss in detail.	***CO2***	***PO 2***	**12**

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