CBCS SCHEME

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BEC502

Fifth Semester B.E/B.Tech. Degree Examination, Dec.2024/Jan.2025
Digital Signal Processing

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	List and discuss different discrete time signals.	7	L2	CO1
	b.	Explain the steps of converting along to digital signal interms of frequencies.	7	L2	CO1
	c.	Discuss the advantages and limitations of Digital Signal Processing (DSP).	6	L2	CO1
		OR			
2	a.	With an example, explain how to verify any signal is periodic or Not.	6	L2	CO1
	b.	Derive the equation for output of a LTI system and list the steps of convolution.	8	L3	CO2
	c.	Write a program to generate : i) Circuit step sequence ii) Sinusoidal sequence.	6	L3	CO2
		Module – 2			
3	a.	Describe the properties of Z – transformation.	7	L3	CO2
	b.	Show that Discrete Fourier Transform (DFT) is a Liner Transformation.	7	L3	CO2
	c.	Compute the A-point DFT of $x(n) = \{1, 1, 0, 0\}$.	6	L3	CO2
		OR			
4	a.	Compute the N-point DFT of, $x(n) = e^{j\omega mn}$.	6	L3	CO2
	b.	State and prove symmetry property of DFT for real valued sequence.	6	L3	CO2
	c.	Compute circular convolution of sequences : $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$.	8	L3	CO2
		Module – 3			
5	a.	State and prove circular item shift property of DFT.	6	L3	CO2
	b.	Compare DFT and FFT with examples.	6	L2	CO3
	c.	Compute Radix – 2 DIT FFT of the following – sequence, $x(n) = n + 1$, for $0 \le n \le 7$.	8	L3	CO3
		OR			
6	a.	State and prove Parseval's theorem for – DFT's.	6	L3	CO2
	b.	Explain overlap – save method used for the convolution of long input sequences.	6	L2	CO3
	c.	Develop an algorithm for Radix – 2 FFT without using built in function.	8	L3	CO3

		Module – 4			
7	a.	Obtain the frequency response expression for the symmetric linear phase FIR filter.	**8**	**L3**	**CO4**
	b.	Compare different widows used to design FIR filters.	**6**	**L2**	**CO4**
	c.	Design an FIR filter using hamming window for N = 7. The desired frequency response is given by $H_d(\omega) = \begin{cases} e^{-j3\omega} & \lvert\omega\rvert \le \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} < \lvert\omega\rvert \pi \end{cases}$.	**6**	**L3**	**CO4**
		OR			
8	a.	Discuss the characteristics of practical frequency selective filters.	**6**	**L3**	**CO4**
	b.	Explain the steps of designing linear phase FIR high pass filter.	**8**	**L2**	**CO4**
	c.	Realize the system function of following FIR filter in cascade form. $H(z) = 1 - 2z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{2}z^{-3} - \frac{1}{2}z^{-4}$.	**6**	**L3**	**CO4**
		Module – 5			
9	a.	Explain the design procedure of analog Butter worth lowpass prototype – filter?	**8**	**L3**	**CO5**
	b.	Construct the system function in S – domain for N = A.	**6**	**L3**	**CO5**
	c.	Realize direct form – II for the IIR filter represented by $y(n) - \frac{1}{4}y(n-1) + \frac{1}{8}y(x-2) = x(n) + \frac{1}{2}x(n-2)$.	**6**	**L3**	**CO5**
		OR			
10	a.	Design the digital IIR filter for following details. –3dB gain at 0.5π rads and the stop band automation of 15dB at 0.75π rads. Assume $T_s = 15$.	**8**	**L3**	**CO5**
	b.	Explain the significance of : i) Prewarping ii) Bilinear transformation.	**6**	**L2**	**CO5**
	c.	Obtain the direct form-I realization of following IIR filter : $H(z) = \frac{1 + 0.4z^{-1}}{1 - 0.5z^{-1} + 0.06z^{-2}}$.	**6**	**L3**	**CO5**

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