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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester B.E. - Electrical and Electronics Engineering

Semester End Examination; August - 2023

Digital Signal Processing

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of DFT and IDFT to various discrete signals, To analyze the discrete signals by using the different properties of DFT

CO2: Understand the FFT algorithms and apply FFT algorithms to find DFT

CO3: Understand the general design and implementation of different digital structure for digital systems

CO4: Carry out the design and implementation of IIR filters and FIR filters

CO5: To understand basics of DSP processor and its applications

Note:* I) PART - A** *is compulsory.* ***Two *marks for each question.*

II) PART - B*: Answer any* ***Two*** *sub questions (from a, b, c) for a Maximum of* ***18 marks*** *from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	Define DFT. Write the applications of DFT.	2	L1	CO1	PO1,2
b.	What are the differences and similarities between DIT and DIF FFT algorithm?	2	L1	CO2	PO1,2
c.	Mention the features of FIR system.	2	L1	CO3	PO1,2
d.	What are the advantages and disadvantages of IIR filter?	2	L1	CO4	PO1,2
e.	Write the applications of DSP.	2	L1	CO5	PO1,2
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Find the 4-point DFT of the sequence, $x(n) = (1, -1, 1, -1)$. Using time shift property, find the DFT of the sequence, $y(n) = x((n-2))_4$.	9	L3	CO1	PO1,2
b.	Compute circular consolation by using DFT and IDFT method. $x_1(n) = (1, 2, 3, 1)$ and $x_2(n) = (4, 3, 2, 2)$	9	L3	CO1	PO1,2
c.	State and prove the following properties of DFT: i) Linearity ii) Circular time shift	9	L2	CO1	PO1,2
	UNIT - II	**18**			
3 a.	Find the 8-point DFT of a sequence, $x(n) = (1, 1, 1, 1, 0, 0, 0, 0)$ using DIT-FFT radix-2 algorithm.	9	L3	CO2	PO1,2
b.	Find the 8-point DFT of sequence, $x(n) = (1, 2, 2, 2, 1, 0, 0, 0)$ using decimation in frequency FFT algorithm.	9	L3	CO2	PO1,2
c.	Develop a decimation in time algorithm FFT of $N = 8$. Draw flow diagram.	9	L2	CO3	PO1,2

		Marks	Level	CO	PO
	UNIT - III	**18**			
4 a.	Obtain a parallel realization for the system represented by the following function: $$H(Z)=\frac{1+\frac{1}{4}Z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$	9	L3	CO3	PO1,2
b.	Sketch the direct form-I direct form-II and realizations for the system function given below; $$H(Z)=\frac{2Z^2+Z-2}{Z^2-2}$$	9	L3	CO3	PO1,2
c.	Realize the linear phase FIR filter having the following impulse response: $$h(n)=\delta(n)+\frac{1}{4}\delta(n-1)-\frac{1}{8}\delta(n-2)+\frac{1}{4}\delta(n-3)+\delta(n-4)$$	9	L3	CO3	PO1,2
	UNIT - IV	**18**			
5 a.	The desired frequency response of a low pass filter is given by, $$H_d(e^{jw})=H_d(w)=\begin{cases} e^{-j3w}, \lvert w\rvert<\frac{3\pi}{4} \\ o, \frac{3\pi}{4}<\lvert w\rvert<\pi \end{cases}$$ Determine the frequency response of the FIR filter if Hanning window is used with N = 7.	9	L2	CO5	PO1,2,3
b.	Derive expression to determine order 'N' and cutoff frequency Ωc of the Butterworth filter.	9	L2	CO4	PO1,2
c.	A third order Butterworth low pass filter has the transfer function $H(s)=\frac{1}{(s+1)(s^2+s+1)}$. Design H(Z) using impulse invariant technique.	9	L3	CO4	PO1,2,3
	UNIT - V	**18**			
6 a.	With a neat diagram explain the architecture of TMS320c5X DSP processor.	9	L2	CO5	PO1,2
b.	Discuss the comparison between DSP processor and general purpose processor.	9	L2	CO5	PO1,2
c.	Briefly explain the features and application of DSP processor.	9	L2	CO5	PO1,2

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