Code No: R2032043 **R20** SET -1

III B. Tech II Semester Regular/Supplementary Examinations, May/June -2024
DIGITAL SIGNAL PROCESSING
(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) What is the condition for stability of an LTI system? [7M]
   b) Find the impulse response $h[n]$ of the system described by the difference equation $8y[n] + 6y[n-1] = x[n]$. [7M]

(OR)

2. a) What are the conditions for stability and causality of an LTI system? Explain [7M]
   b) For a system described by $8y[n[+ 4y[n-1[+ y[n-2[= x[n]$ Find the response to a unit amplitude complex sinusoidal excitation at a DT cyclic frequency Ω. [7M]

UNIT-II

3. a) Explain the significance of FFT algorithms. Draw the basic butterfly diagram for radix - 2 DIT-FFT. [7M]
   b) Find the DFT of x[n]={0.5,0.5,0.5,0.5,-1,-1,-1,-1} using decimation in time algorithm. [7M]

(OR)

4. a) What is FFT? How many multiplications and additions are required to compute N point DFT using redix-2 FFT? [7M]
   b) State and prove convolution Properties of DFT. [7M]

UNIT-III

5. a) Compare direct form I and direct form II realization of IIR systems. [7M]
   b) Realize the following IIR system functions in the direct form I and II and also parallel form $H(Z)=1/(1+aZ^{-1})(1-bZ^{-1})$. [7M]

(OR)

6. a) With an example explain the design procedure for Butterworth filter. [7M]
   b) Give block diagram representation of linear constant-coefficient difference equations. [7M]

UNIT-IV

7. a) Draw the spectrum of rectangular window function. [7M]
   b) What are the characteristics of linear phase FIR digital filters? [7M]

(OR)

8. a) Design an FIR digital low pass filter with cutoff frequency 1.2 radian and length $N = 7$. Use frequency sampling method [7M]
   b) What are the characteristics of FIR digital filters? [7M]

UNIT-V

9. a) What is meant by bit reversed addressing mode? What is the application for which this addressing mode is preferred? [7M]
   b) Draw the pipelined MAC configuration to perform convolution operation and explain with neat timing diagrams. [7M]

(OR)

10. a) What do you mean by circular buffer? [6M]
    b) What are the architectural features of TMS320C5x DSP? [8M]

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Code No: R2032043 **R20** SET -2

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Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1.	a)	State the time shifting property of z-transform.	[7M]
	b)	Determine the impulse response of the filter defined by y(n)=x(n)+by(n-1).	[7M]
		(OR)	
2.	a)	State and prove the properties of convolution.	[7M]
	b)	Give the frequency domain representation of discrete time signals.	[7M]

UNIT-II

3.	a)	Determine IDFT of the following (i) X(k)={1,1-j2,-1,1+j2} (ii)X(k)={1,0,1,0}	[7M]
	b)	Find the DFT of the sequence x[n]={1,2,3,4,5,6,7,8} using DIT FFT.	[7M]
		(OR)	
4.	a)	How is the FFT algorithm applied to determine inverse discrete Fourier transform?	[7M]
	b)	Derive the equation to implement a butterfly structure In DIFFFT algorithm.	[7M]

UNIT-III

5.	a)	Explain the differences between Direct form-I and Direct form-II structures.	[7M]
	b)	What is meant by frequency warping effect?	[7M]
		(OR)	
6.	a)	What are the basic building blocks of realization structures?	[7M]
	b)	Determine the cascade and parallel realization for the system transfer function $H(z) = 3(Z^2 +5Z+4) / (2Z+1)(Z+2)$.	[7M]

UNIT-IV

7.	a)	Draw the frequency response of digital low pass and high pass filters.	[7M]
	b)	Explain the frequency-sampling method of FIR filter design with an example.	[7M]
		(OR)	
8.	a)	What conditions are to be satisfied by the impulse response of an FIR system in order to have a linear phase?	[7M]
	b)	Distinguish between IIR and FIR filters.	[7M]

UNIT-V

9.	a)	What are the special addressing modes of DSP? Explain.	[7M]
	b)	Draw the configuration of a pipelined MAC unit.	[7M]
		(OR)	
10.	a)	Explain the purpose of six registers used in the TMS320C2X processor.	[7M]
	b)	What are the limitations of pipelining in Digital Signal Processor?	[7M]

Code No: R2032043 **R20** SET -3

III B. Tech II Semester Regular/Supplementary Examinations, May/June -2024
DIGITAL SIGNAL PROCESSING
(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Explain the frequency response of discrete time system. [7M]
   b) Determine the frequency response for the system given by y(n)-3/4y(n-1)+1/8 y(n-2) = x(n)- x(n-1). [7M]

(OR)

2. a) Determine whether the following system given by y(n) = log10[{x(n)}] is Casual or not. [7M]
   b) Show that an LTI system can be described by its unit sample response. [7M]

UNIT-II

3. a) Explain the significance of FFT algorithms. Draw the basic butterfly diagram for radix - 2 DIT-FFT. [7M]
   b) Find the DFT of x[n]={0.5,0.5,0.5,0.5,-1,-1,-1,-1} using decimation in time algorithm. [7M]

(OR)

4. a) Compute the DFT for the sequence (0.5,0.5,0.5,0.5,1,1,1,1) using DIF-FFT. [7M]
   b) State and prove convolution Properties of DFT. [7M]

UNIT-III

5. a) Draw the direct form II structure for the given system [7M]
   $$y(n) = y(n-1) - \frac{1}{2}y(n-2) + x(n) - x(n-1) + x(n-2)$$
   b) Explain Transposed forms. [7M]

(OR)

6. a) Prove that FIR filter has linear phase if the unit impulse response satisfies the condition h(n)=h(N-1-n), n=0,1,……M-1. Also discuss symmetric and antisymmetric cases of FIR filter. [7M]
   b) Why IIR filters do not have linear phase? [7M]

UNIT-IV

7. a) Write some examples of multirate digital systems. [7M]
   b) What is a Kaiser window? In what way is it superior to other window functions? [7M]

(OR)

8. a) What is a Hamming window function? Obtain its frequency domain characteristics. [7M]
   b) What is the impulse invariant technique? [7M]

UNIT-V

9. a) Describe the multiplier/adder unit of TMS320c54xx processor with a neat block diagram. [7M]
   b) What are interrupts? What are the classes of interrupts available in the TMS320C5xx processor? [7M]

(OR)

10. a) Explain the different types of interrupts in TMS320C54xx Processors. [7M]
    b) Describe any four data addressing modes of TMS320C54xx processor. [7M]

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Code No: R2032043 **R20** SET -4

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Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1.	a)	State and prove final-value theorem of z-transform.	[7M]
	b)	Determine the impulse response of the filter defined by y(n)=x(n)+by(n-1).	[7M]
		(OR)	
2.	a)	What are the basic elements of a DSP system? Explain.	[7M]
	b)	Test the following systems for time invariance $y(n)=n\,x^2(n)$.	[7M]

UNIT-II

3.	a)	Find the linear convolution of the sequences x[n]={ 1,4,0,9,-1} and h[n]= {-3,-4,0,7}	[7M]
	b)	Find the IDFT of Y (k) = (1, 1, 1, 0).	[7M]
		(OR)	
4.	a)	What are the advantages FFT over DFT.	[7M]
	b)	Find the DFT of the sequence x[n]={1,2,1,2,1,2,1,2} using decimation in time algorithm.	[7M]

UNIT-III

5.	a)	Obtain the direct form I, direct form II and Cascade form realization of the following system functions. Y(n) = 0.1 y(n-1) + 0.2 y(n-2) + 3x(n) + 3.6 x(n-1) + 0.6 x(n-2).	[7M]
	b)	Compare Chebyshev Filter and Butterworth Filter.	[7M]
		(OR)	
6.	a)	Obtain direct form I, direct form II and cascade realizations of system described by the equation, y[n]=y[n-1]-(1/2)y[n-2]+x[n]-x[n-1]+x[n-2]	[7M]
	b)	State and prove Parsvel's theorem.	[7M]

UNIT-IV

7.	a)	Explain the need for the use of window sequence in the design of FIR filter. Describe the window sequence generally used and compare the properties.	[7M]
	b)	Draw the indirect form realizations of FIR systems?	[7M]
		(OR)	
8.	a)	Compare Chebyshev Filter and Butterworth Filter.	[7M]
	b)	Explain the impulse invariance method of IIR filter design.	[7M]

UNIT-V

9.	a)	What are the on-chip peripherals of programmable DSP?	[7M]
	b)	Explain the difference between Von Neumann and Harvard architectures. Which architecture is preferred for DSP applications and why?	[7M]
		(OR)	
10.	a)	Explain what is meant by instruction pipelining.	[7M]
	b)	What is the use of MAC unit in DSP architecture?	[7M]

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