Code No: RT32042 **R13** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017

DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Test whether the following signal is periodic or not ,if periodic find the fundamental period $\sin\sqrt{2}\,\pi\, t$	[4M]
	b)	Find the DFT of a sequence x(n) ={1 ,1, 2, 2}	[4M]
	c)	Give block diagram representation of linear constant-coefficient difference equations.	[4M]
	d)	By impulse invariant method obtain the digital filter transfer function and the differential equation of the analog filter h(s) =1/s+1	[4M]
	e)	What are the applications of multi rate DSP?	[3M]
	f)	List special feature of DSP architecture.	[3M]

PART -B

2	a)	Determine whether each of the following systems defined below is (i) casual (ii) linear (iii) dynamic (iv) time invariant (i) $y(n) = \log_{10}[\{x(n)\}]$ (ii) y(n) = x(-n-2) (iii) y(n) = cosh[nx(n) + x(n-1)]	[12M]
	b)	Give the frequency domain representation of discrete time signals.	[4M]
3	a)	Compute the DFT for the sequence {1, 2, 0, 0, 0, 2, 1, 1}. Using radix -2 DIF FFT and radix -2 DIT- FFT algorithm.	[8M]
	b)	Derive the equation to implement a butterfly structure In DITFFT algorithm.	[8M]
4	a)	Realize the filter $H(z)=(z^{-1}-a)(z^{-1}-b) / (1-az^{-1})(1-bz^{-1})$ in cascade and parallel forms.	[8M]
	b)	State and prove time convolution property of Z-Transforms.	[8M]
5	a)	Obtain the impulse response of digital filter to correspond to an analog filter with impulse response $h_a(t) = 0.5\, e^{-2t}$ and with a sampling rate of 1.0kHz using impulse invariant method.	[8M]
	b)	Compare bilinear transformation and impulse invariant mapping.	[8M]
6	a)	Explain the decimation and interpolation process with an example. Also find the spectrum.	[8M]
	b)	The sequence x(n)=[0,2,4,6,8] is interpolated using interpolation sequence b_k =[1/2,1,1/2] and the interpolation factor is 2.find the interpolated sequence y(m).	[8M]
7	a)	Describe the multiplier/adder unit of TMS320c54xx processor with a neat block diagram.	[8M]
	b)	What are interrupts? What are the classes of interrupts available in the TMS320C5xx processor?	[8M]

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Code No: RT32042 **R13** SET - 2

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017

DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours Maximum Marks: 70

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2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Test whether the following signal is periodic or not ,if periodic find the fundamental period sin20 πt+sin5πt	[4M]
	b)	Find the values of WNk, When N=8, k=2 and also for k=3.	[4M]
	c)	Draw the direct form realization of FIR system.	[4M]
	d)	What are the properties of chebyshev filter?	[3M]
	e)	Find the spectrum of exponential signal decimated by factor 2.	[4M]
	f)	What are the advantages of VLIW architecture?	[3M]

PART -B

2	a)	Determine the impulse response of the filter defined by y(n)=x(n)+by(n-1).	8M]
	b)	A system has unit sample response h(n) given by h(n)=-1/δ(n+1)+1/2δ(n)-1-1/4 δ(n-1). Is the system BIBO stable? Is the filter causal? Justify your answer.	[8M]
3	a)	Find the DFT of the sequence x[n]={1,2,3,4,5,6,7,8}.	[8M]
	b)	Explain the use of FFT algorithms in linear filtering and correlation.	[8M]
4	a)	Determine the cascade and parallel realization for the system transfer function $H(z) = 3(z^2+5z+4) / (2z+1)(z+2)$.	[8M]
	b)	State and prove frequency convolution property of Z-Transforms.	[8M]
5	a)	Design an ideal high pass filter with a frequency response Hd (ejw) = 1 for $\pi/4 \leq \lvert w \rvert \leq \pi$ = 0 for $\lvert w \rvert \leq \pi/4$ Find the values of h(n) for N = 11 using Hamming window. Find H (z) and determine the magnitude response.	[8M]
	b)	Derive the expression for Bi linear Transform.	[8M]
6	a)	Explain the operation used in DSP to increase the sampling rate.	[8M]
	b)	The sequence x(n)=[0,2,4,6,8] is interpolated using interpolation sequence bk =[1/2,1,1/2] and the interpolation factor is 2.find the interpolated sequence y(m).	[8M]
7	a)	Explain the different types of interrupts in TMS320C54xx Processors.	[8M]
	b)	Describe any four data addressing modes of TMS320c54xx processor.	[8M]

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Code No: RT32042 **R13** SET - 3

III B. Tech II Semester Regular/Supplementary Examinations, April - 2017

DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Test the following systems for time invariance $y(n)=n\,x^2(n)$	[4M]
	b)	Define DFT and IDFT	[4M]
	c)	What are the applications of Z-Transforms?	[4M]
	d)	What are the advantages of Kaiser widow?	[4M]
	e)	What are "decimation" , "decimation factor "and "down sampling"?	[3M]
	f)	List the on-chip peripherals	[3M]

PART -B

2	a)	Determine and sketch the magnitude and phase response of the following systems (i) y(n) = 1/3 [x(n) + x(n-1) + x(n-2)] (ii) y(n) = ½[x(n) – x(n-1)] (iii) y(n) - 1/2y(n-1)=x(n)	[12M]
	b)	Determine the impulse response of the filter defined by y(n)=x(n)+by(n-1) .	[4M]
3	a)	Determine IDFT of the following (i) X(k)={1,1-j2,-1,1+j2} (ii)X(k)={1,0,1,0}	[8M]
	b)	Find the DFT of the sequence x[n]={1,2,3,4,5,6,7,8} using DITFFT.	[8M]
4	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).	[8M]
	b)	Explain Transposed forms.	[8M]
5	a)	Comparison of FIR and IIR filters.	[8M]
	b)	What is Hamming Window function? Obtain its frequency domain characteristics.	[8M]
6	a)	What is Multi Rate Signal Processing? Explain any two applications of multirate signal processing.	[8M]
	b)	Derive the Frequency domain Transfer function of a Decimator.	[8M]
7	a)	List the major architectural features used in DSP system to achieve high speed program execution.	[8M]
	b)	With examples explain the different addressing formats supported by DSP processors for various signal processing applications.	[8M]

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Code No: RT32042 **R13** SET - 4

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DIGITAL SIGNAL PROCESSING

(Electronics and Communication Engineering)

Time: 3 hours Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	Test the following systems for time invariance a $^{x(n)}$.	[3M]
	b)	What are the advantages of FFT over DFT.	[4M]
	c)	Find the Z-transform of x(n)= $(1/8)^n$ u(n) and its ROC.	[4M]
	d)	What is the necessary and sufficient condition for linear phase Characteristics in FIR filter?	[4M]
	e)	Explain the term up sampling and down sampling.	[3M]
	f)	What are the different stages in pipelining?	[4M]

PART -B

2	a)	A system has unit sample response h(n) given by h(n)=-1/δ(n+1)+1/2δ(n)-1-1/4 δ(n-1). Is the system BIBO stable? Is the filter causal? Justify your answer	[8M]
	b)	Give the frequency domain representation of discrete time signals and systems.	[8M]
3	a)	How is the FFT algorithm applied to determine inverse discrete Fourier transform?	[8M]
	b)	Derive the equation to implement a butterfly structure In DIFFFT algorithm	[8M]
4	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).	[8M]
	b)	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.	[8M]
5	a)	Determine H(Z) for a Butterworth filter satisfying the following specifications: $0.8 \le \lvert H(e^{j\omega}) \rvert \le 1$, for $0 \le \omega \le \pi/4$ $\lvert H(e^{j\omega}) \rvert \le 0.2$, for $\pi/2 \le \omega \le \pi$ Assume T= 0.1 sec. Apply bilinear transformation method	[8M]
	b)	Use bilinear transformation method to obtain H(Z) if T= 1 sec and H(s) is 1/(s+1)(S+2) , 1/(s2+√2 s +1).	[8M]
6	a)	With necessary derivation explain the operation of sampling rate conversion by a non integer.	[8M]
	b)	The sequence x(n) = [0,3,6,9] is interpolated using interpolation sequence bk=[1/3, 2/3,1,2/3,1/3] and the interpolation factor of 3. Find the interpolated sequence y (m).	[8M]
7	a)	Explain Memory Access schemes in DSPs.	[8M]
	b)	Explain the memory interface block diagram for the TMS 320 C5x processor.	[8M]

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