Code No: **R42026** **R10** **Set No. 1**

IV B.Tech II Semester Regular/Supplementary Examinations, April – 2015

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Find the frequency response of the given system
$y[n] - 3y[n-1] + 5y[n-2] = x[n] - x[n-1]$
Plot the magnitude response. [8]

b) Explain about Linearity, causality and time invariance properties of a system. [7]

2 a) Determine the DFT of the sample data sequence x(n)={1,1,2,2,1,1} and the corresponding amplitude and phase spectrum. [8]

b) State and prove circular shift property of DFT. [7]

3 a) Explain DIF-FFT algorithm for an 8-point sequence. [8]

b) Compute DFT of the following sequence $x(n) = \cos(n\pi / 2)$; $N = 4$ using DIT- FFT algorithm. [7]

4 a) Find the system function H(z) and give the corresponding ROC for the system given by $y[n] + 0.5y[n-1] = x[n] + 0.25x[n-1]$ [8]

b) What are the advantages and applications of Z-transform? [7]

5 a) Design high pass butterworth filter using bilinear transformation using following specifications.
f_p=350 Hz, f_s=1250 Hz, α_p=-3dB, α_s=-10dB, sampling frequency Fs=5000 Hz. [8]

b) What is the importance of digital filters in DSP? Give some applications. [7]

6 a) Design an Ideal filter with a frequency response

$$H_d(e^{jw}) = \begin{cases} e^{-j\alpha w} & ; |w| \le \frac{\pi}{6} \\ 0 & ; \frac{\pi}{6} \le |w| \le \pi \end{cases}$$

Using Hamming window for N=13. [8]

b) Compare IIR and FIR filters. [7]

7 a) Explain the process of interpolation by a factor I of a discrete time signal and draw its spectrum. [8]

b) What are the advantages and applications of multirate sampling? [7]

8 a) Give the bus structure of TMS 320C5X processor and also explain pipelining concept. [8]

b) Write short notes on:
i) Harvard architecture ii) Multiply and accumulate unit [7]

Code No: **R42026** **R10** **Set No. 2**

IV B.Tech II Semester Regular/Supplementary Examinations, April – 2015

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Find the impulse response of the following system whose difference equation is given by
$$y[n] = y[n-1] + 0.5y[n-2] + x[n] + x[n-1]$$ [8]

b) What is meant by BIBO stability and check for BIBO stability of the above system? [7]

2 a) Perform the linear convolution using DFT for the sequences x(n)={1,-1.-1} and h(n)={1,2,3}. [8]

b) State and prove time shifting and symmetry properties of DFS. [7]

3 a) Determine the DFT of x(n) = {2,1,4,6,5,8,3,9} using decimation-in-frequency FFT algorithm. [8]

b) Explain DIT-FFT algorithm for a 4-point sequence and give advantages of FFT. [7]

4 a) Find the system function H(z) and give the corresponding ROC for the system given by $y[n] + 0.25y[n-1] = x[n] + 0.5x[n-1]$. [8]

b) What are the advantages and applications of Z-transform? [7]

5 a) Design a chebyshev HPF using bilinear transformation using following specifications.
$w_p=0.2\pi$ rad/sec, $w_s=0.01\ \pi$ rad/sec, α_p=-1dB, α_s=-10dB. [8]

b) Obtain the digital filter transfer function using impulse invariance method and the differential equation H(s)=1/(s+1). [7]

6 a) Design a low pass filter with pass band gain of unity, cutoff frequency of 1000Hz and working at a sampling frequency of 5KHz using a rectangular window. The length of the impulse response should be 7. [8]

b) Define Linear phase, Group delay and Phase delay? [7]

7 a) What is meant by multistage approach and give the design procedure for Multirate conversion? [8]

b) Show that the transpose of a factor-of-M decimator is a factor-of-M interpolator if the transpose of a factor-of-M down sampler is a factor-of-M -upsampler. [7]

8 a) List the features of TMS 320C5X processor and explain special addressing modes of TMS 320C5X processor. [8]

b) Explain modified bus structures and memory access schemes in DSPs. [7]

Code No: **R42026** **R10** **Set No. 3**

IV B.Tech II Semester Regular/Supplementary Examinations, April – 2015

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 a) Find the step response of the following system whose difference equation is given by
$$y[n] = y[n-1] + 0.5y[n-2] + x[n] + x[n-1]$$ [8]
b) Check for the Time invariance and causality of the given systems
$(i) y(n) = x(2n) \quad (ii) y(n) = x(n+1) + 2x(n)$ [7]

2 a) Determine the eight point DFT of the signal x(n)={1,1,1,1,1,0,0,0} and sketch its magnitude and phase. [8]
b) State and prove circular frequency shift property of DFT. [7]

3 a) Determine the DFT of x(n) = {3,1,1,4,4,1,1,3} using decimation-in-time FFT algorithm. [8]
b) Describe In-place computation and bit reversal order with an example. [7]

4 a) Draw the cascade and parallel form block diagram for a LTI system
$$H(z) = \frac{1}{\left(1+\frac{1}{6}z^{-1}\right)\left(1-\frac{1}{9}z^{-1}\right)}$$ [8]
b) Define ROC and state properties of ROC? [7]

5 a) Design a Butterworth high pass filter satisfying the following specifications.
f_p=0.32K Hz, f_s=0.16K Hz, α_p=0.5dB, α_s=30dB, Fs=1K Hz. [8]
b) Determine H(z) that results when the bilinear transformation is applied to $H_a(s)=\frac{s}{S^2+0.692s+0.504}$ [7]

6 a) Design an Ideal high pass filter with a frequency response
$$H_d(e^{jw}) = \begin{cases} 1 \ ; \frac{\pi}{4} \le |w| \le \pi \\ 0 \ ; \ |w| \le \frac{\pi}{4} \end{cases}$$
Using Hanning window for N=9. [8]
b) What is meant by linear phase and how linear phase is achieved in FIR filters? [7]

7 a) Explain the process of interpolation by a factor I of a discrete time signal and draw its spectrum. [8]
b) Explain the advantages of multirate sampling with examples? [7]

8 a) Draw the architecture of TMS 320C5X processor and explain its special features. [8]
b) Give the differences between Von Neumann and Harvard architecture. [7]

Code No: **R42026** **R10** **Set No. 4**

IV B.Tech II Semester Regular/Supplementary Examinations, April – 2015

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1 a) Find the frequency response of the given system
$y[n] - 3y[n-1] + 5y[n-2] = x[n] - x[n-1]$
Plot magnitude response. [8]

b) Check for the Time invariance and stability of the given systems
$(i) y(n) = ax(n)$ +b $\quad (ii) y(n) = 2x(n) + nx(n+1)$ [7]

2 a) Determine the eight point DFT of the signal x(n)={1,2,1,2,1,2,1,2} and sketch its magnitude and phase. [8]

b) Find convolution of h(n)={1,-3,5} and x(n)={-1,4,7,3,-2,9,10,12,-5,8} using overlap-add method. [7]

3 a) Evaluate the 8-point DFT using DIT-FFT algorithm for the sequence
X(n)= $\begin{cases} 1 \ for -3 \le n \le 3 \\ 0 \ otherwise \end{cases}$ [8]

b) Explain DIF-FFT algorithm for a 4-point sequence and give advantages of FFT. [7]

4 a) Define Z - transform and give the relation between *Z* &*S* Transforms? [8]

b) What is meant by ROC and give some of its properties? [7]

5 a) Design a Chebyshev filter satisfying the following specifications.
$\frac{1}{\sqrt{2}} \le H_d(e^{jw}) \le 1 \quad for\ 0 \le w \le 0.2\pi$
$0 \le H_d(e^{jw}) \le 1 \quad for\ 0.5\pi \le w \le \pi$
[8]

b) Describe Impulse Invariance method and frequency warping? [7]

6 a) Design an Ideal Low pass filter with a frequency response [8]
$H_d(e^{jw}) = \begin{cases} 1 \ ; \frac{\pi}{2} \ge w \ge -\frac{\pi}{2} \\ 0 \ ; \ \pi \ge |w| \ge \frac{-\pi}{2} \end{cases}$
Using Hamming window for N=9.

b) Discuss about frequency sampling technique for FIR filter design. [7]

7 a) Explain upsampling and downsampling with neat sketches. [8]

b) Write short notes on: i)Multi rate signal processing and ii) Anti-imaging filter [7]

8 a) What are the addressing modes for TMS3205X DSP Processor? Explain with examples. [8]

b) Write short notes on i) Multiplier Accumulator (MAC) Unit ii) Pipelining [7]