KADI SARVA VISHWAVIDHYALAYA

BE 7th Semester.

Examination –November 2016

Sub code: EC- 701 **Sub Name: Digital Signal Processing**

Date: 8/11/2016 **Time:10:30am to 01:30pm** **Total Marks:70**

Instructions:

1. Answer Each Section in Separate Answer sheet.
2. Use of Scientific Calculator is permitted. .
3. All questions are separate
4. Indicate clearly, the options you attempted along with its respective question number.
5. Use the last page of supplementary for rough work.

SECTION I

Q.1 (a) What is convolution? State and Proof the commutative law for convolution. **[05]**

(b) **Short Question:** **[05]**

1. Define A-periodic Signal & Periodic Signal.
2. Define Static system?
3. Define a Signal?
4. What is meant by sampling rate?
5. State sampling theorem

(c) A discrete time signal is given X(n) =1 for -2<=n<=1 **[05]**
=1/2 for n=2,3,4
= 0 others
Find (1) X(n-2) (2)X(4-n) (3) X(n+2) (4) $X(n^2)$ (5) Even samples of X(n)

OR

(c) A discrete time signal is given X(n) =1+n/3 for n= -3,-2,-1 **[05]**
=1 for n=0,1,2,3
= 0 others
Find (1) X(-n) (2)X(4-n) (3) X(n)u(2-n) (4) X(n-1)u(n-3) (5) X(n+3)

Q.2 (a) Find the convolution using mathematical method of following pairs of discrete sequences 1. $x(n) = \{1,2,1,-1\}$ $h(n) = \{1,2,3,1\}$ **[05]**

(b) Which of the following systems are causal LTI systems? Justify. **[05]**
A. y(n)= x(n) – x(n-2) **B.** y(n) =x(-n)

OR

Q.2 (a) Perform Convolution sun using Graphical Method **[05]**
X[n]={1,2,3,-1} and H[n]={1,2,1}

(b) Explain what is meant by stability criteria for discrete time system **[05]**

Q-3 (a) Determine the Z Transform of $X(n) = r^n\cos[w_0n]$ n>=0 **[05]**
= 0 for elsewhere

(b) State and prove the differentiation property of Z transform **[05]**

OR

Q-3 (a) Find out the Z transform of the following sequence. [05]

1. $X(n) = \{1,0,1,\underset{\uparrow}{2},1,3,4,5\}$

2. $X(n) = \{1, 2,, \underset{\uparrow}{4}, 6,, 5, 1\}$

(b) What is ROC? Write Down the property of ROC. [05]

SECTION II

Q.4 (a) List of DFT Properties and Proof any two property. [05]

(b) Compute DFT of signal $x(n) = \{1,0,0,1\}$ [05]

(c) Perform circular convolution of sequence [05]

$X1(n) = \{1,3,5,3\}$ $x2(n) = \{2,3,1,1\}$

OR

(c) Write down the convolution property in Z Transform? Find the convolution of given sequence using Z Transform. [05]

$X1(n) = \{1, -2,1\}$ $x2(n) = \{1,1,1,1,1\}$

Q.5 (a) Using radix - 2 algorithm, plot flow graph for N=16. [05]

(b) Determine IZT using Power series method: [05]

$$X(Z) = \frac{1}{1-a^{z-1}}$$

OR

Q.5 (a) Explain IIR and FIR Characteristics Comparison [05]

(b) Explain Direct Form-I structure. [05]

Q-6 (a) Explain Impulse invariant method [05]

(b) Explain Harvard Architecture. [05]

Q-6(a) Explain Bilinear Transformation Transformation [05]

(b) List out the DSP application and Explain Any one in details diagram. [05]

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B.E SEMESTER : 7th **EXAMINATION (November / 2015)**

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DATE: 20/11/2015 TIME: 10:30 am to 01:30 pm TOTAL MARKS: 70

Instructions:

1. Answer each section in separate Answer Sheet.
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Section - 1

Q:1 All Compulsory

(A) What is signal? Define A-periodic Signal & Periodic Signal with example. 05

(B) Explain sampling and quantization in detail. 05

(C) $x[n] = 1 + n/3$ for $-3 \leq n \leq -1$ 05

$=1$ for $0 \leq n \leq 3$

$=0$ for elsewhere

Prove TD[FD]≠FD[TD] for x[n].

OR

(C) Check the following Systems for time invariance and Linearity. 05

1) $y(n) = n[x(n)]^2$
2) $y(n) = x(n) \cos(n\pi/4)$

Q:2 Answer the following Question.

(A) For given sequence $x(n) = \mathbf{2^n}$ and $\mathbf{N = 8}$, find X(k) using DIT FFT algorithm 05

(B) Using graphical method ,find a-5point circular convolution of two signal defined as 05

$x(n)=\mathbf{(1.2)^{n+1}}$,0<=n<=2 and $y(n)=\mathbf{2n-3}$, 0<=n<=3.

OR

(A) Explain Z-Transform with example. List advantages of Z-Transform over Fourier Transform. 05

(B) Explain digital signal processor TMS 320 series with block diagram. 05

Q:3 Answer the following Question.

(A) Short note on Decimation in Frequency FFT 05

(B) Determine the direct forms I and II realizations for a third – order IIR transfer function. 05

$$H(z) = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2}$$

OR

(A) List Z-Transform of standard formulas. 05

(B) Explain Von Neumann architecture and Howard architecture with block diagram. Give Difference between Von Neumann architecture and Howard architecture. 05

Section - 2

Q:4 All Compulsory

(A) For the given two 4 point sequence x[n] and h[n] where 05

$x[n] = \cos(n\pi/2)$ where n = 0,1,2,3

$h[n] = 2^n$ where n = 0,1,2,3

1] calculate 4- point DFT of x[n]

2] calculate 4- point DFT of h[n]

(B) Find the Inverse DFT of X(k) = (1,2 ,3,4) 05

(C) Explain relationship of DFT to Z Transform. 05

OR

(C) Determine the response of LTI system whose impulse response h(n) and input x(n) given by 05

$h(n) = \{1, 2, 1, -1\}$, $x(n) = \{1, 2, 3, 1\}$

Q:5 Answer the following Question

(A) Using time shifting Property of Z transform, determine Z transform and ROC of Signal $x(n) = (4)^{n+2}\, U(n-1)$. 05

(B) Give the computational efficiency of FFT over DFT 05

OR

(A) Obtain the system function H(Z) for the system described by the difference equation, 05

$y(n) - 3y(n-1) + 2y(n-2) = x(n) - x(n-1)$

Realize the filter using 1] Direct Form **I**, 2] Direct Form **II**, 3] Cascade Form, 4] Parallel form for all cases, Draw the structures neatly with system equations at different points.

(B) Explain the window functions used in FIR filter design. 05

Q:6 Answer the following Question

(A) Short Note on: The Goertzel Algorithm 05

(B) Short Note on: Chebyshev Filter 05

OR

(A) Design a Digital Butterworth low pass filter with pass band magnitude within 1 dB for frequency $0 \leq \omega < 0.2\,\pi$ and stop band attenuation greater than 15dB for frequency $0.3\pi \leq \omega < \pi$. Use bilinear transformation method. 05

(B) Compare FIR Vs IIR filters. 05

-----All the Best --------