Section D

7. (a) Draw and explain the register structure of digital signal processor manufactured by Texas Instruments. **12.5**

(b) Describe multi-resolution analysis using Dauvechies wavelets. **12.5**

8. (a) Write an assembly language program for linear convolution using DSP processor. **12.5**

(b) Describe the following :

(i) Barrel Shifters

(ii) Harr wavelet transform and its applications. **12.5**

9. Answer the following : **10×2.5=25**

(a) List the factors influencing the selection of DSPS.

(b) What are the advantages of Keiser Window ?

(c) What are the various stages of pipelining ?

(d) Distinguish between the frequency response of Chebyshev (type I and type II) filters.

(e) What is Warping effect ? What is its effect in mangnitude and phase ?

Roll No. ..... **Total Pages : 05**

MAR-21-210244

B. Tech. EXAMINATION, March 2021

Semester VII (NS)

DIGITAL SIGNAL PROCESSING

EC-413

Time : 2 *Hours* *Maximum Marks :* 100

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks.

Section A

1. (a) Determine whether each of the following systems is/are causal, linear, time invariant and stable : **12.5**

(i) $y(n) = nx^2(n)$

(ii) $y(n) = x(n^2)$

(b) Find the z-transform and ROC of the following sequence : **12.5**

(i) $x(n) = \sin(nw)\mu(n)$

(ii) $x(n) = n^2a^n\mu(n)$

2. (a) Use convolution to find $x(n)$ if $x(z)$ is given by : **12.5**

(i) $\dfrac{z^{-2}}{1-\frac{1}{2}z^{-1}}$ for ROC : $|z| > \dfrac{1}{2}$

(ii) $\left(1-z^{-1}-z^{-2}\right)\left(1+z^{-1}+2z^{-2}\right)$

(b) State and prove frequency convolution property of Discrete time Fourier transforms. **12.5**

Section B

3. (a) Find circular convolution of the following sequences : **12.5**

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

using DFT and IDFT method.

(b) Explain divide and conquer approach for the computation of the DFT. **12.5**

4. Compute 4-point DFT of a sequence :

$$x(n) = \{0, 1, 2, 3\}$$

using DIT and DIF algorithm. **25**

Section C

5. (a) Design a third order Butterworth digital filter using impulse invariant technique (assuming sampling period T = 1 sec.) **12.5**

(b) Realise the following system functions using a minimum number of multipliers : **12.5**

$$H(z) = \left(1-\frac{1}{2}z^{-1}+z^{-2}\right)\left(1-\frac{1}{4}z^{-1}+z^{-2}\right)$$

6. Design an ideal differentiator with frequency response :

$$H\left(e^{jw}\right) = jw \quad -\pi \le w \le \pi$$

using :

(a) Rectangular window

(b) Hamming window with N = 8

Plot frequency response in (a) and (b). **25**

(f) List the differences and similarities between DIF and DIT algorithms.

(g) What do you understand by periodic convolution ?

(h) Find the z-transform of digital impulse and a digital step.

(i) What is aliasing effect ?

(j) What is the property of recursive and non-recursive systems ?

(f) List the differences and similarities between DIF and DIT algorithms.

(g) What do you understand by periodic convolution ?

(h) Find the z-transform of digital impulse and a digital step.

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