Exam. Code: 0937
Sub. Code: 6993

1128

B.E. (Electrical and Electronics Engineering)
Seventh Semester
EE-708: Digital Signal Processing

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

x-x-x

Q1a) Find the convolution of x(n)={1,2,3,4,5} with h(n) = {1,2,3,3,2,1}?

b) Determine whether the following systems are static, casual, time invariant, linear and stable

i) $y(n) = x^2(n)$ and ii) $y(n) = log_{10}\, x(n)$

c) Find the DFT of a sequence

$x(n)$ ={1,1,0,0}

d) Convert the analog filter with system function H(s) into digital filter using bilinear transformation

$H(s) = \frac{s+0.3}{(s+0.3)^2+16}$ .Assume T=1 seconds

e) What are different buses of TMS320C5X and its functions? **(2x5=10 Marks)**

PART A

Q2a) Prove that LTI system is BIBO stable if and only if its impulse response is absolutely summable? **(5 Marks)**

b) The signal $x(t) = 10 \cos(\pi t)$ is sampled at a rate of

i) 8 samples per second and ii) 10 samples per second. Can the original signal be recovered from samples ? Explain. Plot the amplitude spectrum for $|w| \leq 30\pi$

(5 Marks)

Q 3a) Consider the following difference equation

$$y(n) + 5y(n-1) + 6y(n-2) = x(n-1) + 2x(n)$$

where x(n)=u(n). The initial conditions are y(-1)=1 and y(-2)=0. Find i) zero state response, ii) zero input response and iii) Total response

(5 Marks)

P.T.O.

b) Compute 8 point DFT of x(n) given by

x(n)={2,2,2,2,1,1,1,1). Using radix 2 DIF FFT. Also draw its butterfly diagram. **(5 Marks)**

Q 4 a) Determine the Inverse Z transform for $X(Z) = \frac{Z^2+2}{(z-1/4)(z-1/2)^3}$

i) For ROC |Z|>1/2 ii) For ROC |Z|<1/4 **(5 Marks)**

b) Develop DIT FFT algorithm for decomposing the DFT for N=12=3.4. Draw the butterfly diagram **(5 Marks)**

PART B

Q5 a) Explain frequency transformation? Obtain the transfer function of the first order analog band pass filter from that of first order analog low pass filter? **(5 Marks)**

b) For the given specification design a digital butterworth filter

$0.707 \leq |H(j\Omega)| \leq 1 \ for \ 0 \leq \Omega \leq 0.5\pi$

$|H(j\Omega)| \leq 0.2 \ for \ 0.75\pi \leq \Omega \leq \pi$ Using bilinear transformation. Assume T=1 seconds **(5 Marks)**

Q6 a) Determine the direct form II and transposed direct form II for the given system

$y(n) = \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) + x(n) + x(n-1)$ **(5 Marks)**

b) For the desired frequency response

$$H_d(w) = \begin{cases} e^{-j2w}, & -\frac{\pi}{4} < w < \frac{\pi}{4} \\ 0, & \frac{\pi}{4} < |w| < \pi \end{cases}$$

Determine the transfer function of digital FIR filter of filter length 5 using Rectangular window function **(5 Marks)**

Q7 a) Draw the architecture outlines of TMS320C5X processors and explain its features. **(5 Marks)**

b) Obtain the direct form I, direct form II, cascade and parallel ralization of system given by

$H(z) = \frac{1+0.5z^{-1}}{(1-z^{-1}+0.25\,z^{-2})\,(1-z^{-1}+0.5z^{-2})}$ **(5 Marks)**

x-x-x