Exam Code:0925
Sub. Code: 6863

1078

B.E. (Information Technology)
Seventh Semester
ITE-741: Digital Signal Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

Q.1
i. Is the signal: $y(n)= \cos(n/4) \cos(n\pi/4)$ periodic? If yes what is its fundamental period?
ii. What is the z transform of $n^2u(n)$? Draw the ROC also.
iii. What is the reduction in complex additions and multiplications if FFT algorithms are used to find N point DFT?
iv. Define Canonical Filter Structures.
v. Name four unique features of Digital Signal Processors.

PART A

Q.2a Explain five advantages of DSP.
b Find out whether the $y(n) = n^3x(-n) + 4x(n^3)$ system is
i. Static
ii. Linear
iii. Time invariant
iv. Causal
v. Stable

Q.3 For a discrete time LTI system output y(n) is $2(1/5)^n u(n)$ when the input x(n) is u(n). Using Z-transformation and its inverse:
a) Find the impulse response h(n) of the system.
b) Find the output y(n) when the input x(n) is $(1/2)^n u(n)$.

Q.4a Explain the properties of DFT.
b Compute the 8 point DFT of the sequence $x(n) = \{-2,0,1,0,-2,0,4,0\}$ using the radix-2 DIT Algorithm.

PART-B

Q.5a Obtain the direct form II structure for the system:
$y(n) = -0.2y(n-1) + 0.7y(n-2) + 0.5x(n) - 0.25x(n-2)$
b Explain the architecture of ADSP 21XX family of processors with block diagram

Q.6a What are the two main methods of IIR filter design? Also compare them.
b Design a digital IIR filter using BLT method, if the analog filter is specified by

$$H_a = \frac{s+0.1}{(s+0.1)^2+16}; \omega_r = \pi/4.$$

Q.7a Derive the condition for linear phase in FIR filters. Explain where and why FIR filters are useful.
b Design the symmetric FIR low pass filter for which desired frequency response is $H_d(\omega) = e^{-j\omega\tau}$ for $|\omega| \le \omega_c$ and 0 elsewhere. The length of the filter should be 7 and $\omega_c = \pi/4$ radians/sample. Make use of the Hanning Window having: $\omega(n) = \frac{1}{2}\left[1 - \cos\frac{2\pi n}{M-1}\right]$

x-x-x