2124

B. E. (Information Technology)
Seventh Semester
PCIT-701: 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 a What is BIBO stability? What are the conditions for BIBO stability?

    b What is the significance of ROC of $X(z)$?

    c Write computation efficiency of FFT over DFT

    d Define canonical and non-canonical structures.

    e What is the Kaiser window? Why is it superior to other window functions?   (5x2)

PART A

Q.2a Check the system: $y(n) = 3y^2(n-1) - nx(n) + 4x(n-1) - 2x(n+1)$ for linearity, time variance and causality. Explain the meaning of all these properties as well.

    b State initial and final value theorems.   (7,3)

Q.3a Determine the z transform and ROC for the following sequence: $x(n) = 3^n u(n+2) - 4^n u(-n-2)$

    b Prove following properties of DFT

    i) Linearity ii) Circular time shifting iii) Circular frequency shifting

    iv) Time reversal v) Complex conjugate.   (5,5)

Q.4a. Find the circular convolution of the following sequences $x(n) = \{1,5,6,4\}$, and $y(n) = \{2,4,1,3\}$.

    b. Compute the 8 point DFT of the sequence $x(n) = \{2, 4, 0, 1, 0, 6, 1, 2\}$ using the radix-2 DIT Algorithms. Follow exactly the signal flow graph and calculate all intermediate values.   (2,8)

PART-B

Q.5   Obtain the cascade and parallel form realization for the system

    $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$ (10)

Q.6a   Comparison of FIR and IIR filters.

    b   Convert the analog filter to a digital filter whose system function is $H(s) = 1/\{(S+0.2)^2 + 16\}$. Use bilinear transform.   (5,5)

Q.7   Discuss briefly the following special Digital Signal Processor hardware units.

    (i) Multiplier and Accumulator (MAC) Unit

    (ii) Shifters

    (iii) Address Generators   (4,3,3)

x-x-x