R16

Code No: 136BE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2019

DIGITAL SIGNAL PROCESSING

(Common to ECE, EIE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) What is the necessary and sufficient condition on the impulse response for stability. [2]

b) Find the z-transform of the sequence $x(n) = (\frac{1}{3})^{n-1} u(n-1)$. [3]

c) Write the differences between DFT and FFT. [2]

d) What is the speed improvement factor in calculating 64-point DFT of a sequence using direct computation and FFT algorithms? [3]

e) Compare analog and digital filters. [2]

f) What the properties of properties of the bilinear transformation? [3]

g) Describe the various characteristic features of windows. [2]

h) Distinguish between FIR and IIR filters. [3]

i) What is mean by limit cycle oscillations? [2]

j) What is significance of decimator and interpolator in multirate DSP? [3]

PART - B

(50 Marks)

2.a) Obtain the direct form-II realization for the given system.

$$y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-2)$$

b) Determine the transfer function H (Z) of the system given by [6+4]

$$y(n-1) + 5y(n) = 4x(n) + 5x(n-1) + 6x(n-2)$$

OR

3.a) Find the impulse response of the system described by difference equation $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$ using z transform.

b) Test if the following system is linear time invariant or not. [5+5]

$$y(n) = Ax(n) + B$$

4.a) Find the y(n) for the sequences x(n)={1,-1,1,2,1,0,1,-4,3,2,1,0,1,1} and h(n)={1,1,2,1} using overlap-save method.

b) Discuss the relation between DFT and Z-transform. [6+4]

OR

5. Find the 8-point DFT of {2,1,2,1} using DIF-FFT. Draw the signal flow graph for N=8 with intermediate values. [10]

6. Determine the order and poles of type-I chebyshev low pass filter for the given specifications [10]

$\alpha_p = 1dB,\ \alpha_s = 40dB,\ \Omega_p = 1000\pi\, rad/\sec,\ \Omega_s = 2000\pi rad/\sec.$

OR

7.a) Show that $s = \frac{2}{T}\left[\frac{1-z^{-1}}{1+z^{-1}}\right]$ in the designing of IIR filter using bilinear transformation method.

b) Discuss impulse invariance method. What are its disadvantages? [6+4]

8.a) Compare Hamming window and Rectangular window in terms of characteristics.

b) Prove that for a linear phase FIR filter the impulse response is symmetric. [5+5]

OR

9. Design an ideal low pass filter with frequency response

$$H_d(e^{j\omega}) = 1 \text{ for } -\frac{\pi}{2} \le \omega \le \frac{\pi}{2}$$

$$= 0 \text{ for } \frac{\pi}{2} \le |\omega| \le \pi$$

Find the values of h(n) using hamming window for N=11. Find the H (z). [10]

10.a) Discuss the finite word length effects in FIR filters.

b) What is Round-off Noise in IIR Digital Filters? Discuss its effects in IIR filters. [5+5]

OR

11. Describe the interpolation process with factor D and obtain the necessary expressions. [10]

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