Code No: 117CK

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, April/May - 2018
DIGITAL SIGNAL PROCESSING
(Electrical and Electronics Engineering)

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) Define a shift invariant system.   [2]
  b) List the applications of Z – transform?   [3]
  c) What is zero padding? Why it is needed?   [2]
  d) Find the IDFT of $X(k) = \{1, 2, 3, 4\}$.   [3]
  e) What is frequency warping?   [2]
  f) What are the advantages and disadvantages of bilinear transformation?   [3]
  g) What is Gibbs phenomenon?   [2]
  h) Write the characteristics features of rectangular window.   [3]
  i) Where is multi-rate signal processing used?   [2]
  j) What do you mean by aliasing?   [3]

PART-B

(50 Marks)

2.a) How are discrete time signals classified ? Differentiate between them.
  b) Find the linear, invariance and casuality of given system: [5+5]
      $y(n) = x(n) - ax(n - 1)$

OR

3.a) Write the properties of ROC of $X(z)$.
  b) Find the digital network in direct and transposed form for system described by the
      difference equation.   [5+5]
      $y(n) = x(n) - 0.3\, x(n - 1) - 0.7\, x(n - 2) + 0.6\, y(n - 1) + 0.8\, y(n - 2)$

4.   Perform circular convolution of the following sequences using DFT and IDFT: [10]
      $x_1(n) = \{1, 2, 1, 2\}$ and $x_1(n) = \{4, 3, 2, 1\}$

OR

5.a) Develop a radix-4 DIT FFT algorithm for evaluating the DFT for $N = 16$.
  b) Find the DFT of the given sequence by using DIF FFT.   [5+5]
      $x(n) = \{0.5, 1.5, -0.5, -0.5\}$

6.a) Write the transfer function of unnormalized butterworth low pass filter.
  b) Discuss the digital frequency transformation.   [5+5]

OR

7.a) Justify the statement IIR filter is less stable and give reason for it.

b) Discuss the impulse invariant method and also explain its limitations. [5+5]

8.a) Write the steps in the design of FIR filters.

b) Compare the hamming and Kaiser windows. [5+5]

OR

9. Design a FIR digital low-pass filter with a cutoff frequency of 1 kHz and a sampling rate of 4 kHz with 7 samples using Fourier series method. [10]

10.a) Obtain the necessary expression for interpolation process.

b) Discuss the applications of multi-rate signal processing. [5+5]

OR

11. Explain the effect of aliasing in decimation with the frequency spectrum and discuss how the aliasing can be eliminated. [10]

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