

**III B. Tech II Semester Supplementary Examinations, December -2023****DIGITAL SIGNAL PROCESSING**

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

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**UNIT-I**

1. a) Perform addition and multiplication of the discrete time signals,  $x_1(n) = \{2, 2, 1, 2\}$  and  $x_2(n) = \{-2, -1, 3, 2\}$  [7M]
- b) State and prove final value theorem with regard to Z-transform? [7M]
- (OR)
2. a) With suitable example, express the discrete time signal  $x(n)$  as a summation of impulses? [7M]
- b) What is BIBO stability? What is the condition to be satisfied for stability? [7M]

**UNIT-II**

3. a) Find the response of an LTI system with impulse response  $h(n) = \{2, 1, 3\}$  for the input  $x(n) = \{1, 2\}$  using DIT radix-2 FFT algorithm? [7M]
- b) State and prove convolution theorem of DFT? [7M]
- (OR)
4. a) Compute the eight point DFT of the sequence  $x(n) = \{1/2, 1/2, 1/2, 1/2, 0, 0, 0, 0\}$  using radix 2 decimation in time and radix 2 decimation in frequency algorithm. [7M]
- b) What is twiddle factor? What are the phase factors involved in the third stage of computation in the 8-point DIT radix-2 FFT? [7M]

**UNIT-III**

5. a) Determine the poles of low pass Butterworth filter for  $N=1$ . Sketch the location of poles on s-plane and hence determine the normalized transfer function of low pass filter? [7M]
- b) Write the magnitude function of low pass Butterworth filter? How the order of the filter affects the frequency response of Butterworth filter? [7M]
- (OR)
6. a) Draw the basic structure of IIR system and explain in brief? [7M]
- b) Sketch the magnitude response of type-1 chebyshev filter? How will you determine order  $N$  of chebyshev filter? [7M]

**UNIT-IV**

7. a) Derive the frequency response of linear phase FIR filter when impulse response is symmetric with centre of symmetry at  $(N-1)/2$  and  $N$  is odd? [7M]
- b) Draw the structure of FIR lattice filter for  $N^{\text{th}}$  order and explain the same? [7M]
- (OR)
8. a) Explain the design procedure of FIR Filters by Frequency Sampling Technique? [7M]
- b) List out the different types of window sequences used in FIR filter? List the characteristics of FIR filters designed using windows? [7M]

**UNIT-V**

9. a) Draw and explain the modified Harvard architecture employed in DSPs? [7M]
- b) Briefly discuss about MAC unit in DSPs with neat diagram? [7M]
- (OR)
10. a) What are the functional units of CPU of TMS320C5x processor? Explain [7M]
- b) List out the features of the TMS320C5x family of digital signal processors? [7M]

