Code No: R1931024 **R19** **SET - 1**

III B. Tech I Semester Supplementary Examinations, June/July-2022

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) Explain, with an example, the inverse z-transform computation based on residue method. [8M]
   b) Define the following: [7M]
   (i) Stability (ii) Causality (iii) Linearity

(OR)

2. a) State and prove the convolution property of z-transform. [8M]
   b) Show that any arbitrary DT sequence can be represented in terms of weighted sum of impulse functions. [7M]

UNIT-II

3. a) The DFT of a length-6 sequence is $X[k] = \begin{matrix} 4, & k = 0 \\ 2, & 1 \leq k \geq 5 \end{matrix}$ [8M]
   Find $x[n]$.
   b) Find the circular convolution of the sequences [7M]
   $$x[n] = [1 \quad -1 \quad -0.5 \quad 0]$$
   and
   $$h[n] = [1 \quad -0.5 \quad -1 \quad 0]$$
   using graphical method.

(OR)

4. a) Determine the flow graph of decimation-in-time FFT for the computation of 8-point DFT. [8M]
   b) Compute and plot the magnitude of the DFT of the sequence [7M]
   $$x[n] = n, for\ 0 \leq n \leq 7$$

UNIT-III

5. a) Draw the magnitude response of analog lowpass Butterworth, Chebyshev-I and Chebyshev-II filters. [8M]
   b) Realize the following transfer function using canonical form structure: $H(z) = \frac{1+\frac{1}{6}z^{-1}+\frac{1}{6}z^{-2}}{(1-\frac{1}{8}z^{-1}-\frac{1}{8}z^{-2})}$. [7M]

(OR)

6. a) Design an analog lowpass Chebyshev Type-I filter satisfying the following specifications: $A_{pass} = 0.75\,dB$, $A_{stop} = 30\,dB$, $f_{pass} = 100\,Hz$, $f_{stop} = 500\,Hz$. [8M]
   b) Write notes on impulse invariant transformation. [7M]

UNIT-IV

7. a) Explain the frequency sampling method of FIR filter design. [7M]
   b) Design a 5th order FIR digital highpass filter with cutoff frequency $\frac{\pi}{3}$ rad. Use Hanning window. [8M]

(OR)

8. a) Design a linear phase lowpass FIR digital filter using Hamming window to meet the following specifications: $\Omega_c = 0.45\pi$ and $L = 11$. [8M]
   b) Draw the magnitude and phase response of digital lowpass, highpass, bandpass and bandstop filters with proper labeling. [7M]

UNIT-V

9. a) Give the time-domain and frequency-domain description of a down-sampler. [8M]
   b) Write notes on digital filter banks. [7M]

(OR)

10. a) What is the need for multirate digital signal processing? Explain. [8M]
    b) Explain the process of sub-band coding of signals. [7M]

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