EC 313 (R-20)

Total No. of Questions : 10] [Total No.of Pages : 02

III/IV B. Tech. DEGREE EXAMINATIONS, DECEMBER - 2022

First Semester

ELECTRONICS AND COMMUNICATIONS ENGINEERING

DIGITAL SIGNAL PROCESSING

Time : **Three Hours** Maximum : **60** Marks

Answer ONE Question from each Unit.

All questions carry equal marks. 5x12=60 M

UNIT - I

1. a) What are the properties of LTI system ? Explain them.

   b) Check y(n) = 3x(n-2) + 3x(n+2) is a causal linear system.

(OR)

2. a) Realize the following system with minimum number of multipliers
   $H(Z) = 0.5 + 0.75Z^{-1} + 0.8Z^{-2} + 0.9Z^{-3} + 2Z^{-4} + 0.9\ Z^{-5}$.

   b) Explain about advantages and applications of DSP ?

UNIT - II

3. a) Determine the DFT of a sequence X(n) = {1, 1, 0, 0}.

   b) State and prove Linearity, time shifting & time convolution properties of Z-Transform.

(OR)

4. a) Compute the FFT of the sequence x(n) = {1,0,0,0,0,0,0,0}.

   b) Determine DFT of the sequence x(n) = {1, 0, 0, 0} using FFT algorithm.

UNIT - III

5. a) Using bilinear transformation, design a high pass filter, monotonic in passband with cutoff frequency of 1000Hz and down 10dB at 350Hz. The sampling frequency is 500Hz.

   b) Find 4 point DFT using DIF of x(n) = (0, 1, 2, 3).

P.T.O.

(OR)

6. a) Discuss the steps to design an analog Butterworth low pass filter.
   b) compare Radix-2 DIT and DIF FFT algorithms.

UNIT - IV

7. a) Consider a single stage decimator with the following specifications : Original sampling rate = 8kHz Decimation factor M = 4 Frequency of Interest = 0-800Hz Passband ripple= 0.002 dB Stop-band attenuation = 46dB. Draw the block diagram for the decimator ?
   b) Determine the window type, filter length and cutoff frequency if the window method is used for the anti-aliasing FIR filter design.

(OR)

8. a) Design an FIR low-pass filter using Fourier series method for the specifications given below (use Hann window).
   Frequency of pass-band edge = 200Hz.
   Frequency from which stop-band begins = 600Hz Sampling frequency = 1000Hz
   Order of the filter N = 12
   Filter length required L=N+1=13
   b) Discuss about generalised Hamming window ?

UNIT - V

9. a) Explain how Ladder realizations effect finite register length in FIR filter design.
   b) Obtain the frequency response of Linear phase FIR filter for a symmetrical impulse function with N odd.

(OR)

10. a) Explain briefly about the decimation and interpolation by integer factor.
    b) List the applications of multi rate signal processing.