

Time allowed: 3 Hours

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

Max. Marks: 50

x-x-x

1. (a) Determine the Fourier transform of the signal:  $x[n] = (-a)^n u[n]$
- (b) Discuss sampling and reconstruction of signals.
- (c) Determine the impulse response of the system using Z-transform  
 $y[n] = 0.6y[n-1] - 0.08y[n-2] + x[n]$
- (d) Compare FIR filters with IIR filters.
- (e) Differentiate fixed-point and floating-point numbers.

(5×2=10)

Section-A

2. Describe the following properties of a discrete-time system: Memoryless, Time-Invariant, Linear, Causal, and Stable. Check the following systems with respect to these properties: (10)

- a.  $y[n] = x[n] \sum_{k=-\infty}^{\infty} \delta[n-2k]$
- b.  $y[n] = \cos(2\pi x[n+1]) + x[n]$
- c.  $y[n] = x(n) + n \cdot x(n+1)$

3. (a) Describe radix-2 DIT FFT algorithm with the help of butterfly diagram. (5)
- (b) Describe time-frequency analysis using wavelet transform. (5)

4. (a) Determine the signals having z-transform (5)

$$X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}} \quad (5)$$

- (b) Describe the circular convolution property of DFT.

Section-B

5. (a) A LPF is to be designed with the following desired response (6)

$$H_d(\omega) = \begin{cases} e^{-j3\omega} & 0 \leq \omega \leq \frac{\pi}{2} \\ 0 & \frac{\pi}{2} \leq \omega \leq \pi \end{cases}$$

- Determine the filter coefficients  $h(n)$  for  $M=7$  using hamming window. (4)
- (b) Discuss finite word length effects present in digital filters.

(2)

6. (a) Obtain direct, cascade and parallel form structure of system

$$H(z) = \frac{(3 + 5z^{-1})(0.6 + 3z^{-1})}{(1 - 2z^{-1} + 2z^{-2})(1 - z^{-1})}$$

(5)

- (b) Describe the frequency domain representation of multirate system.

(5)

7. Describe the following:

d. Architecture of TMS 320CXX

e. Polyphase decomposition

(5, 5)

x-x-x