Total Marks 80

(3 Hours)

N.B: 1) Question **number 1** is compulsory.
2) Attempt **any three** out of remaining.
3) Assume suitable data if **necessary** and justify the assumptions.
4) Figures to the **right** indicate full marks.

1 a) State whether unit step sequence is energy or power signal. Calculate Corresponding energy or average power as the case may be. [05]

b) Perform convolution operation between given function in time domain if [05]
$x(n)=\{ 2^{-n} \quad -2<=n<=2$
$\{ 0 \quad$ otherwise and
$h(n)=u(n+2)-u(n-2)$

c) Find the auto-correlation of the causal sequence x(n)={2, 4, 6, 8} [05]

d) State the condition for stability of LTI system and determine for the given discrete time system [05]
$h(n)=(2)^n u(n)+(0.5)^n u(n)$ is stable or not.

2 a) Determine whether or not the following signals are periodic. If periodic specify its fundamental period. [10]
i) x1(n)=sin(0.2Πn+3)
ii) x2(n)=sin(0.5Πn)+5cos(0.25n)

b) i) If x(n)={3, 4, 0, 6} Find DFT X[k] [10]
ii) Using results obtained in i) and not otherwise find DFT of following sequences
x1(n)={6, 3, 4, 0}

3 a) Check whether following systems are [10]
i) Static or Dynamic
ii) Linear or Nonlinear
iii) Shift variant or Shift invariant
iv) Causal or Noncausal
i) $y(n)=n.x^2(n)$
ii) y(n)=3x(n) + 5

b) For x(n)={1, 2, -1, 5, 0, 4}, Plot the following discrete time signals [10]
↑
i) x(n+3)
ii) x(-n-2)
iii) x(n).u(n-1)
iv) x(n-2).δ(n-2)
v) x(2n)

4 a) Find the DFT of the 8 point causal sequence using radix 2 DIT-FFT [10]
x(n)=(2, 1, 2, 1, 1, 2, 1, 2}

b) Find the circular convolution of following causal sequences in time domain [05]
x1(n)={1, 2, 5} and x2(n)={4, 7}
so that result of linear and circular convolution will be same.

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c) Compare 128 point DFT and Radix 2- DIT-FFT with respect to the number of complex additions and multiplications required. [05]

5 a) In a LTI system the input x(n)={1, 1, 3} and impulse response is h(n)={2, 3}. Determine the response of LTI system using radix-2 DIT-FFT method. [10]

b) Consider the 8 point sequence defined as 0<=n<=7 [05]
x(n)={1, 2, 3 , 0, 1, 2, 5, 2} with a 8 point DFT. Evaluate the following function X[k] without computing DFT
$\sum |X[k]^2|$

c) Determine 4 point DFT amd sketch the magnitude of DFT x(n)={ 1, 1, 0, 0} [05]

6 a) Find Linear Convoltion of following causal signals using overlap add method. [10]
x(n)={1, 2, 0, 1, 2, 3, 1, 1, 2, 1, 0, 3}
h(n)={2, 2, 1}

b) Write a detailed note on speech recognition. [05]

c) Compare Microprocessor with Digital Signal Processor. [05]
