

(3 hours)

Total Marks: 80

N.B. 1. Question No. 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

- Q1 A Determine the energy of signal given by $x(n) = (1/4)^n u(n)$. 05
 B Compare microprocessor with digital signal processor. 05
 C Define BIBO Stable system. 05
 D Find the Linear Convolution of the following causal signals 05
 $x_1(n) = \{3, 2, 4, 1\}$ and $x_2(n) = \{2, 1, 3\}$.
- Q2 A Given $a[n] = \{1, 2, 3, 4\}$ using DFT properties 10
 (a) Find $A[k]$ which is DFT of $a[n]$
 (b) Let $b[n] = \{1, 4, 3, 2\}$ Find $B[k]$ which is DFT of $b[n]$ using $A[k]$.
 (c) Let $c[n] = \{2, 6, 6, 6\}$ Find $C[k]$ which is DFT of $c[n]$ using $A[k]$.
 (d) Let $d[n] = \{2, 1, 4, 3\}$ Find $D[k]$ which is DFT of $d[n]$ using $A[k]$.
- B Draw DIT FFT flow graph for 8-point sequence and compute DFT for causal 10
 sequence $x(n) = \{1, 2, 2, 1, 1, 2, 2, 1\}$.
- Q3 A Perform Cross correlation of the causal sequences 10
 $x(n) = \{3, 3, 1, 1\}$, $y(n) = \{3, 2, 1, 2\}$
- B Consider the following analog signal 10
 $x(t) = 5 \cos 2\pi(2000t) + 6 \cos 2\pi(4000t)$ to be sampled.
 I) Evaluate the Nyquist rate for this signal.
 II) If the signal is sampled at 6 kHz, will the signal be recovered from its samples?
- Q4 A Compute linear convolution of the causal sequences 10
 $x[n] = \{1, 2, 3, -1, 2, -2, 0, -1\}$ and $h[n] = \{-1, 2, 1\}$ using overlap save method.
- B For $x(n) = \{-2, 1, 2, -1, 6, 4, 5\}$, plot the following Discrete Time signals: 10
 1.) $x(n+2)$ 2.) $x(-n)u(-n+1)$ 3.) $x(-n-2)$
 4.) $x(n-1)u(n)$ 5.) $x(n+1)$

- Q5 A For the causal LTI digital filter with impulse response given by $h(n) = 2\delta(n) + 2\delta(n-1) + 2\delta(n-2) + 2\delta(n-3)$ sketch the magnitude response of the filter. 10
- B Check whether the system $y[n] = nx[n] + 2x[n-1]$ is: 10
- i) Static or Dynamic
 - ii) Linear or Non-linear
 - iii) Causal or Non-Casual
 - iv) Shift variant or Shift Invariant
- Q6 A Explain with the example significance of Carl's Correlation Coefficient Algorithm in digital signal processing. 10
- B Write a detailed note on DSP Processor. 10
-