

(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 sequence  $x(n) = \{1, 2, 2, 1, 1, 2, 2, 1\}$ . 10
- 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
-