QP CODE : 22974

(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   Compare microprocessor with digital signal processor.   05

      B   State whether x[n] = cos(3π n/4) is an energy or power signal with proper   05

           justification.

      C   Find the cross correlation of two causal sequences x[n] = {2, 3, 1, 4} and   05
           y[n] = 3 δ(n-3) -2 δ(n)+ δ(n-1)+4 δ(n-2).

      D   State BIBO stability criterion for LTI systems. Test the stability of the LTI   05
           systems, whose impulse response is: h[n] = 0.2^n u[-n] +3^n u[-n].

Q2   A   Check whether the system y[n]= a^n u[n] is: 10
           i)Static or Dynamic
           ii)Linear or Non-linear
           iii)Causal or Non-Casual
           iv) Shift variant or Shift Invariant

      B   Consider analog signal x(t) =2 sin 80πt.If the sampling frequency is 60 Hz, find   10
           the sampled version of discrete time signal x[n] also find an alias frequency
           corresponding to Fs =60 Hz.

Q3   A   Determine the output response of the LTI system using tabular method , whose   10
           input is:
            x[n]= 1   ; n= 0, 1
                 = 3   ; n= 2, 3
                 = 0   ;elsewhere
           and h[n] = δ[n] - 2 δ[n-1] + 3 δ[n-2] - 4δ[n-3].

      B   Compute DFT of sequence x[n] = {0, 2, 3, -1}. Sketch the magnitude and   10

           phase spectrum.

Q4   A   Explain the following properties of DFT :   10
           i)Periodicity
           ii)Linearity
           iii)Time Shift
           iv)Circular Convolution
           v)Time Reversal

      B   Compute linear convolution of the causal sequences x[n]= {4, 4, 3, 3, 2, 2, 1, 1}   10
           and h[n]={-1, 1} using overlap save method.

                                                                    [TURN OVER]

                                          1

Q5 A In a LTI system the input x[n] = {1, 2, 1} and impulse response is h[n] = {1, 3}.   10
       Determine the response of LTI system using radix- 2 DIT FFT method.

    B Explain Parseval's energy theorem.   10
       If IDFT { X(k)}= x[n] ={2, 1, 2, 0} using DFT properties, evaluate the
       following:
       i)IDFT of {X(k-1)}
       ii)IDFT of {X(k) circularly convolved with X(k)}
       iii)IDFT of {X(k).X(k)}
       iv)Signal energy

Q6 A Explain the significance of Carl's Correlation Coefficient Algorithm in digital   10
       signal processing. Evaluate Carl's Coefficient for two causal sequences
       x[n]={3, 4, 7, 8} and y[n]={2, 1, 1, 2}.

    B i) Compare 64 point DFT and FFT systems with respect to the number of   5
       complex additions and multiplications required.
       ii) Write a detailed note on biomedical applications of DSP processors.   5

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