P5024

T.E. / Insem. - 522
T.E. (E & Tc)
DIGITAL SIGNAL PROCESSING
(2012 Pattern) (Semester - I)

Time : 1 Hour]   *[Max. Marks :30*

Instructions to the candidates:
    1)   Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6.
    2)   Neat diagrams must be drawn wherever necessary.
    3)   Figures to the right indicate full marks.
    4)   All questions carry equal marks.
    5)   Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
    6)   Assume suitable data, if necessary.

Q1) a)   What are the advantages and limitations of digital signal processing. **[4]**

    b)   Consider the analog signal

    $x_a(t) = 5 \cos (2000 \pi t) + 3 \sin (6000 \pi t) + 10 \cos (12000 \pi t)$ **[6]**

    i)   What is the Nyquist rate of the signal?

    ii)   If $F_s = 5000$ samples / sec., what is the discrete- time signal obtained after sampling?

    iii)   What is the analog signal $y_a(t)$ that can be reconstructed in (ii), if ideal interpolation is used?

OR

Q2) a)   Explain the frequency relationship between continuous time and discrete time signals. **[3]**

    b)   What is the need of antialiasing filter in a DSP system? **[3]**

    c)   Determine which of the following pairs of vectors are orthogonal? **[4]**

    i) $a_1 = [-2\ 1\ 3\ -1\ 1]$ & $b_1 = [4\ -1\ 0\ -1\ 8]$

    ii) $a_2 = [1\ 3\ -2\ 2\ 4]$ & $b_2 = [5\ 2\ -3\ -1\ 2]$

P.T.O

Q3) a) State and prove any two properties of DFT. **[4]**

b) Find the 4 point DFT of the following sequence x (n) = {1 2 3 4 }. **[4]**

c) Write short note on Overlap Save Method. **[2]**

OR

Q4) a) Find X (k) Using DIT FFT algorithm for N = 4. **[4]**

x(n) = {0 1 2 3}.

b) Compute the DCT of the following sequence x (n) = {1 2 4 7}. **[4]**

c) Write short note on Overlap Add Method. **[2]**

Q5) a) State and prove any two properties of Z transform. **[4]**

b) Find the Z transform of the following sequences and state ROC. **[6]**

i) $x(n) = a^n, \ n \geq 0$

$\quad = 0, \ n < 0$

ii) $x(n) = \left(\dfrac{1}{3}\right)^{n-1} u(n-1)$

iii) $x(n) = \{1 \ 2 \ 3 \ 4\}$
$\qquad\qquad\quad \uparrow$

OR

Q6) a) State the relationship between Z transform and DFT. **[3]**

b) Compute Inverse Z transform of

i) $X(z) = \dfrac{1}{(1+z^{-1})(1-z^{-1})^2} \ \text{for} |z| > 1$

ii) $X(z) = \dfrac{1}{3z^2 - 4z + 1} \ \text{for} |z| > 1$ **[5]**

c) Plot ROC and pole - zero pattern of $X(z) = \dfrac{z^4 - 1}{z^4}$ **[2]**

ⓘ ⓘ ⓘ