Total No. of Questions : 6]

P4879

SEAT No. :

[Total No. of Pages : 2

T.E./Insem. - 127
T.E. (E&TC)
DIGITAL SIGNAL PROCESSING
(2012 Pattern) (Semester - I)

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

Instructions to the candidates :

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right side indicate full marks.*
4) *Assume suitable data if necessary.*

UNIT - I

Q1) a) What should be the sampling frequency to avoid aliasing for an analog signal represented as : **[6]**

$x(t) = \cos(150\pi t) + 2\sin(300\pi t) - 4\cos(600\pi t)$?

Obtain the discrete time signal if this sequence is sampled at Fs = 400 Hz. Does aliasing occur? If yes, calculate the aliased frequencies from the original frequencies.

b) Show that the basis matrix for DFT is orthogonal. Consider N=4. **[4]**

OR

Q2) a) State the sampling theorem and explain the effect of aliasing in the frequency domain. What type of input signal conditioning is done in practical DSP systems so as to avoid aliasing? **[4]**

b) Determine which of the following pairs of vectors are orthogonal. **[6]**

i) al = [-2 1 3 -1 1] & b1 = [4 -1 0 -1 8]

ii) a2 = [1 3 -2 2 4] & b2 = [5 2 -3 -1 2]

iii) a3 = [1 3 -2 -2 4] & b3 = [3 2 -3 -1 2]

iv) a4 = [1 3 -3 2 -1] & b4 = [-4 1 -3 -2 4]

and obtain the corresponding orthonormal vector pairs.

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UNIT - II

Q3) a) Using the DFT method, obtain the circular convolution of the following :

$x1(n) = [1 \ \ 2 \ \ 1 \ \ -2]$

$x2(n) = [3 \ \ -2 \ \ 1 \ \ -3]$

Verify your result using the graphical method. **[8]**

b) How is the DFT of a sequence obtained from the corresponding DTFT? Why is the DFT used in computations instead of the DTFT. **[2]**

OR

Q4) a) State the formula for obtaining the DCT of a sequence and calculate the same for:

$x(n)=[1,3,5,7]$. **[6]**

b) Compare DFT and FFT on basis of computational complexity for N = 64, 256 and1024. **[4]**

UNIT - III

Q5) a) Compute the zero state response of the system

$y(n)=0.7y(n-1)-0.12y(n-2)+x(n-1)+x(n-2)$

to input

$x(n)=nu(n)$. Is this system stable? **[7]**

b) Obtain the z-transform of the following:

$x(n)=(0.5)^n u(n) + (-0.2)^n u(n-3)$. **[3]**

OR

Q6) a) Determine the causal signal x(n) having the z-transform **[6]**

$$X(z) = \frac{1}{(1-2z^{-1})(1-z^{-1})^2}$$

b) State and prove the differentiation property of z-transform. **[4]**

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