Oct.-16/T.E./Insem.-21
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 indicate full marks.*

4) *Assume Suitable data, if necessary.*

Q1) a)   With the help of block diagram explain the basic elements of DSP**[4]**

b)   Consider the analog signal   **[4]**

$Xa(t) = 3\cos 2000\pi t + 5\sin 6000\pi t + 10\cos 12000\pi t$

i)   What is the Nyquist rate for this signal

ii) If this analog signal is sampled at F_s = 5000 samples/sec, What is the discrete time signal obtained after sampling?

iii) What is aliasing? How it can be reduced?   **[2]**

OR

Q2) a)   What are the advantages of Digital Signal Processing over Analog Signal Processing   **[4]**

b)   Show the mapping between analog frequencies and digital frequencies. **[4]**

c)   Consider the analog signal   **[2]**

$X(t) = 5\sin(500\pi t)$

if the signal is sampled at Fs=1500HZ.

i)   What is the discrete time signal obtained after sampling

ii) Find the frequency of discrete time signal

P.T.O.

Q3) a) State and prove any two properties of DFT **[3]**

    b) Find the circular convolution of the following sequences **[4]**

        $x1(n) = \{1, 2, 3, 4\}$ $x2(n) = \{2, 2, 1, 3\}$

    c) Find the DFT of the following sequence & check your result by using IDFT $x(n) = \{0, 1, 2, 3\}$ **[3]**

<p align="center">OR</p>

Q4) a) Show that the computational complexity is reduced if 32 point DFT is computed uisng Radix - 2 DIT FFT algorithm. **[3]**

    b) Compute the 4 point DITFFT of the following sequence **[4]**

        $x(n) = \{1, 2, 3, 4\}$

    c) Write short note on. "Linear Filtering using Overlap add Method" **[3]**

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

    b) Find inverse Z transform of the following **[6]**

        i) $x(z) = \dfrac{1 - 0.5\,z^{-1}}{1 - 0.25\,z^{-2}} \; |z| > \dfrac{1}{2}$

        ii) $x(z) = \dfrac{z^2}{(z-1)(z-0.2)}$

<p align="center">OR</p>

Q6) a) Find the Z transform and ROC of the following signals **[4]**

        i) $x(n) = -b^n u(-n-1)$

        ii) $x(n) = na^n u(n)$

    b) Find the transfer function and impulse response of the system described by the difference equation. **[2]**

        $y(n) = \dfrac{1}{5} y(n-1) + x(n)$

    c) Determine the pole-zero plot for the system described by difference equation **[4]**

        $y(n) - \dfrac{3}{4} y(n-1) + \dfrac{1}{8} y(n-2) = x(n) - x(n-1)$

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