Total No. of Questions : 6]

SEAT No. :

P22

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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]**

OR

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

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

OR

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]**

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