Total No. of Questions : 6]

SEAT No. :

P5074

[Total No. of Pages : 2

T.E./Insem.-622

T.E. (E & TC) (Semester - I)

DIGITAL SIGNAL PROCESSING

(2015 Pattern)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.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) An analog signal is given by

$$x(t)=3\cos 100\pi t+2\sin 300\pi t-4\cos 100\pi t$$

i) What is the Nyquist rate for this signal?

ii) Write the equation of sampled signal.

iii) If the signal is sampled at a rate of 200 sam/sec. What is the discrete time signal obtained after sampling. **[6]**

b) Explain the basic elements of DSP system. **[4]**

OR

Q2) a) Explain the concept of basis function and orthogonality. Check whether the functions given are orthogonal or not over a time interval [0, 1].

$$f(t)=1;\ x(t)=\sqrt{3}(1-2t).$$ **[6]**

b) What are the advantages of digital signal processing over analog signal processing. **[4]**

P.T.O.

Q3) a) Compute the DFT of following sequence

$$x(n)=\text{Cos}\frac{n\pi}{4}\ n=0,1,2,3\ .$$ **[4]**

b) Given $x(n)=[0\ 1\ 2\ 3]$, find $x(k)$ using DIT FFT algorithm. **[4]**

c) How many computations are required to compute 16 point DFT using DFT & FFT algorithm. **[2]**

OR

Q4) a) Compute the circular convolution of following sequences **[4]**

$x_1(n)=\{1\ 1\ 2\ 2\}\ \ x_2(n)=\{1\ 2\ 3\ 4\}$.

b) State and prove circular time shift property. **[6]**

Q5) a) State and prove the convolution property of Z.transform. **[4]**

b) Compute the Z.transform of following sequences **[6]**

i) $x(n)=n\,u(n)$.

ii) $x(n)=\left(\frac{1}{2}\right)^n u(n)+(3)^n u(-n-1)$.

OR

Q6) a) For **[6]**

$$X(z)=\frac{z}{3z^2-4z+1}$$

Find $x(n)$

if ROC is i) $|z|>\frac{1}{3}$.

ii) $|z|<1$.

iii) $\frac{1}{3}<|z|<1$.

b) Explain the causality and stability of discrete time systems w.r.t. Z.transform. **[4]**