Total No. of Questions : 10]

SEAT No. :

P 3279

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TE (E & TC) (Engg.) (Semester - I)

DIGITAL SIGNAL PROCESSING

(2012 Pattern)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10***
2) ***Assume suitable data, if necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) What are the advantages of Digital signal processing over analog signal processing. **[4]**

b) Check the orthogonality of the vectors. **[4]**

$$A1 = (1,3,2)^T \; A2 = (3,-1,0)^T \; A3 = \left(\frac{1}{3}, 1, -\frac{5}{3}\right)^T$$

c) State and prove any two properties of Z transform **[2]**

OR

Q2) a) Compute 4 point DFT of a sequence x(n) = {0,1,2,3} using Decimation In Time FFT algorithm **[4]**

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

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

c) Write a note on, "Overlap and save method" **[2]**

Q3) a) What is the relationship between DFT and DTFT **[3]**

b) Compute the IDFT of the following sequence **[4]**

X (k) = {4,1-j,-2, 1+ j}

c) By using partial fraction method find the Inverse Z transform of **[3]**

$$x(z) = \frac{z}{(z+2)(z-1)}$$

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OR

Q4) a) Show that the computational complexity is reduced if 64 point DFT is computed using Radix -2 DIT FFT algorithm **[3]**

b) Compute the z transform and draw ROC of the following sequences **[4]**

i) $x(n) = a^n u(n) \quad for \quad n \geq 0$

ii) $x(n) = 2^n u(n) + 3^n u(-n-1)$

c) State the properties of Region of convergence **[3]**

Q5) a) The system transfer function of analog filter is given by **[8]**

$$H(s) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$$

using Impulse Invariance method determine H (z) Assume T = 1Sec

b) Compare Bilinear transformation and Impulse Invariance method **[6]**

c) Show the mapping between analog and Digital frequencies **[4]**

OR

Q6) a) Obtain direct form I, Direct Form II, Cascade and Parallel form realization of a system described by **[10]**

y(n) = 0.75y (n-1) - 0.25 y(n-2) + x (n) + 2x (n-1) - x (n-2)

b) A digital filter has specifications as :

Passband frequency = Wp = 0.4Π, Stopband frequency = Ws = 0.6Π

What the corresponding specifications are for pass band and stop frequencies in analog domain if **[6]**

i) Impulse Invariance Technique is used for designing

ii) Bilinear Transformation method is used for designing

c) Compare Rectangular window with Hanning window **[2]**

Q7) a) State the characteristics of FIR filter **[6]**

b) Design a linear phase FIR low pass filter with cut off frequency fo 0.5 rad/sample by taking 11 samples of ideal frequency response **[10]**

OR

Q8) a) The frequency characteristics of ideal low pass filter is given as **[10]**

$$H(w) = 1 \quad for -\frac{\pi}{2} \le w \le \frac{\pi}{2}$$

$$= 0 \quad for \frac{\pi}{2} \le w \le \pi$$

Design digital FIR filter using fourier series method

i) Find the value of h (n) for N = 9

ii) Find the system function H(Z)

b) Realize the linear phase FIR Filter **[6]**

y(n) = x(n) + 2 x(n-1) + 2x(n-2) + x(n-3)

Q9) a) Explain the application of DSP in Voice processing **[6]**

b) Design a two stage decimator for the following specifications : **[10]**

Sampling rate of an input signal = 20 KHZ

Down sampler D = 80

Passband = 0 to 40 Hz

Transition band = 40 to 50 Hz

Passband ripple = 0.02

Stopband ripple = 0.002

OR

Q10)a) Explain important salient features of TMS320C 6713 DSP processor and draw its functional block diagram. **[8]**

b) Explain the necessity of Barrel shifter **[4]**

c) Compare DSP processors with Microprocessors **[4]**

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