Total No. of Questions : 8] **SEAT No. :**

P5118 **[Total No. of Pages : 2**

[5560]-552
T.E. (E & TC) (Semester - VI)
DIGITAL SIGNAL PROCESSING
(2015 Pattern)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Discuss the merits, demerits and application of digital signal processing. **[6]**

b) Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{1,1,1\}$ and input signal $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using Overlap add method. **[7]**

c) State and prove the Differentiation and scaling properties of z-transform. **[7]**

OR

Q2) a) If $x(t) = \sin(70\pi) + \cos(55\pi)$ is sampled by fs = 200Hz frequency. Then find out Nyquist rate, Nyquist interval and Nyquist frequency. **[6]**

b) If $x(n) = \{1,2,1,2\}$ and $h(n) = \{1,-1,2,1\}$, compute the circular convolution using DFT-IDFT method. **[7]**

c) Compute the z-transform and ROC of the following sequence : **[7]**

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

Q3) a) For a given specifications of the desired low pass filter given below.

$$0.707 \le |H(\omega)| \le 1.0, \qquad 0 \le \omega \le 0.2\pi$$

$$|H(\omega)| \le 0.08, \qquad 0.4\pi \le \omega \le \pi$$

design a Butterworth filter using bilinear transfomation. **[8]**

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b) Draw cascade and parallel realization for the system given by **[9]**

$$H(z)=\frac{1-z^{-1}}{1-0.2z^{-1}-0.15z^{-2}}$$

OR

Q4) a) Design a digital low pass Butterworth IIR filter using bilinear transformation for following specifications : **[8]**

f_c = 1kHz, f_s = 3kHz, F_s = 8kHz, R_p = 2dB, and A_s = 15dB

b) Apply Bilinear Transformation to $H(s)=\frac{2}{(s+2)(s+3)}$ with T = 0.1 sec. **[9]**

Q5) a) Explain Gibbs Phenomenon observed in FIR filter design. What are the desired features of window functions to improve frequency response? **[8]**

b) Realize a linear phase FIR filter structure having following impulse response: $h(n)=\delta(n)+\frac{1}{2}\delta(n-1)-\frac{1}{4}\delta(n-2)+\frac{1}{2}\delta(n-3)+\delta(n-4)$ **[9]**

OR

Q6) a) What is the use of windowing? Explain the features of Kaiser Window. **[8]**

b) Design a linear phase FIR band filter using hamming window with cut off frequencies 0.2 rad/sec & 0.3 rad/sec, M=7. **[9]**

Q7) a) Discuss the interference cancellation in ECG using DSP. **[8]**

b) Explain two band digital crossover in detail. **[8]**

OR

Q8) a) Draw a block diagram of Digital crossover audio systems. Explain in brief. **[8]**

b) Explain Compact disc recording system in detail. **[8]**