

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 $f_s = 200\text{Hz}$ 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.

$$0.707 \leq |H(\omega)| \leq 1.0, \quad 0 \leq \omega \leq 0.2\pi$$

$$|H(\omega)| \leq 0.08, \quad 0.4\pi \leq \omega \leq \pi$$

design a Butterworth filter using bilinear transformation.

[8]

P.T.O.

- 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]

$$f_c = 1\text{kHz}, f_s = 3\text{kHz}, F_s = 8\text{kHz}, R_p = 2\text{dB}, \text{ and } A_s = 15\text{dB}$$

- 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]

