B.E. Sixth Semester (Electrical & Electronics Engg.) (CGS)

10389 : Digital Signal Processing : 6 EX 01

P. Pages : 2 | **AU - 2761**

Time : Three Hours | Max. Marks : 80

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.
5. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) A discrete time signal x(n) is defined as. 7

$$x(n) = \begin{cases} 1+\frac{n}{2} & -3 \le n \le -1 \\ 1 & 0 \le n \le 3 \\ 0 & \text{Elsewhere} \end{cases}$$

1) Det^m & sketch signal x(n)
2) Fold x(n) and delay resulting signal by three samples.
3) Delay x(n) and fold resulting signal by three samples

b) Check the following systems for linearity, Causality, time invariance 6

i) $y(n) = e^{x(n)}$ ii) $y(n) = x(n) + 2x(n-1)$

OR

2. a) Compute convolution $y(n) = x(n) * h(n)$ 6

$x(n) = \{1, 1, \underset{\uparrow}{0}, 1\}$ & $h(n) = \{1, -2, -3, \underset{\uparrow}{4}\}$

b) Find the natural response of the system describe by difference equation 7

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

Initial Cond^n $y(-1) = y(-2) = 1$

3. a) Compute the discrete time Fourier transform (DTFT) of following signals. 6

i) $x(n) = a^n u(n)$

ii) $x(n) = \begin{cases} 1 : & 0 < n < 6 \\ 0 : & \text{otherwise} \end{cases}$

b) Derive the radix 2 decimation in time algorithm and draw butterfly diagram for N = 8. 8

OR

4. Find the DFT of the following sequence $x(n) = \{1, -1, -1, -1, 1, 1, 1-1\}$ Using DIFFFT algorithm & sketch the necessary flow graph. 14

5. a) An analog signal x(t) is – 6
$x(t) = 4\cos 100\pi t + 2\cos 200\pi t$
Find : i) Nyquist sampling rate
ii) If x(t) is sampled at a rate $f_s = 5000\,Hz$. What is the discrete signal obtained after sampling.

b) Explain quantization process in ADC. 7

OR

6. a) Explain the oversampling Sigma – Delta A/D Converter with help of neat block diagram. 7

b) Explain in detail sampling of bandpass signals. 6

SECTION – B

7. a) Consider a system defined by difference equation 6
$$y(n) - \frac{3}{4}\,y(n-1) + \frac{1}{8}\,y(n-2) = x(n) + \frac{1}{3}\,x(n-1)$$
realize the system in cascade form.

b) A certain LTI filter has following data 8
i) Poles are at 0.2 & 0.6 ii) Zeroes are at – 0.4 & Origine
iii) Gain factor K = 4 Determine – Direct (I) & (II) form.

OR

8. Design Ideal LPF with frequency response 14
$$H_d(e^{jw}) = 1 \quad -\pi/2 \le \omega \le \pi/2$$
$$= 0 \quad \pi/2 \le \omega \le \pi$$
for N = 11 using rectangular window.

9. a) Derive the formula for Bilinear transformation, so as to convert analog filter to digital filter. 7

b) If $H_a(s) = \dfrac{s+0.1}{(s+0.1)^2 + 25}$ design digital filer for T = 1sec by using impulse invariant method. 6

OR

10. a) Design a Butterworth low pass filter with bilinear transformation for the following specification- 7
i) Pass band gain = 1db ii) Passband frequency cutoff at 0.3π rad/sec
iii) Stop band gain = 15db iv) Stop band frequency cutoff at 0.6π rad/sec if T = 1sec.

b) Explain in detail warping effect with neat diagram and its elimination method. 6

11. a) What are the different source of interrupts in DSP processor. Hence explain interrupt vectors and interrupt latency. 6

b) Compare Microprocessor and DSP processor. 7

12. a) How does direct memory access (DMA) helps to increase processing speed of DSP processor. 6

b) Explain in detail super scalar processing. 7

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