

Total No. of Questions : 12]

SEAT No. :

P2344

[4758]-82

[Total No. of Pages : 4

T.E. (Computer)

DIGITAL SIGNAL PROCESSING

(2008 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) What is discrete time system? Explain any four classification of discrete time system with example. **[18]**

OR

Q2) a) Determine the values of power and energy of the following signals. Find whether the signals are power, energy or neither energy nor power signals. **[15]**

i) $x(n) = (1/3)^n u(n)$

ii) $x(n) = \text{sign}(\pi/4 n)$

iii) $x(n) = e^{2n} u(n)$

b) Write note on: Quantization error. **[3]**

P.T.O.

Q3) a) Define Fourier Transform, obtain it for $x(n): a^n u(n)$, $|a| < 1$ and state necessary conditions for existence of FT. [8]

b) Compute the circular convolution of the following sequence: [8]

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

OR

Q4) a) What is zero padding? What are its uses? [4]

b) State and prove periodicity property of DFT. [8]

c) Find the sequence $x(n)$ if its fourier transform $X(e^{j\omega}) = 1$. [4]

Q5) a) State and prove linearity property of Z- transform. Determine the ZT and ROC of the signal $x(n) = [3(2^n) - 4(3^n)] u(n)$ [10]

b) What is meant by radix-2 FFT? How many multiplications and additions are required to compute N-point DFT using radix-2 FFT? Draw the 4-point radix-2 DIT FFT butterfly structure for DFT. [6]

OR

Q6) a) State and prove convolution property of Z-transform. Compute the convolution $x(n)$ of the signals $x_1(n) = \{1, -2, 1\}$ and $x_2(n) = \{1, 1, 1, 1, 1, 1\}$ [10]

b) Calculate DFT of the sequence $x(n) = \cos(\pi n/2)$ where $N = 4$ using DIFFFT algorithm. [6]

SECTION - II

Q7) a) An impulse response of discrete time system is $u(n)$. What will be output of the system if the input is [8]

i) $\delta(n)$ and

ii) $u(n)$? Whether this system is stable?

- b) A system has unit sample response $h(n)$ given by $h(n) = -1/4\delta(n+1) + 1/2\delta(n) - 1/4\delta(n-1)$ [8]
- i) Is the system BIBO stable?
- ii) Is the filter causal?
- iii) Compute the frequency response and plot it.

OR

- Q8)** a) LTI system is described by $h(n) = (0.9)^n u(n)$. Calculate and plot magnitude response of the system. [8]
- b) State and prove time delay property of unilateral Z transform. [8]
- Q9)** a) Determine the unit sample response of the ideal low pass filter. Why it is not realizable? [8]
- b) Justify: stable analog filter always gives stable digital filter. [6]
- c) $H_a(s)$ is given as, $H_a(s) = \frac{1}{(s+1)^2}$ and $T_s = 0.1$ sec. Find $H(z)$ using bilinear transform. [4]

OR

- Q10)**a) State the characteristics of ideal filter. What are the advantages and disadvantages of digital filter over analog filter. [8]
- b) The system function of the analog filter is given as $H_a(s) = \frac{(s+0.1)}{(s+0.1)^2 + 16}$. Obtain the system function of the digital filter using bilinear transformation which is resonant at $\omega_r = \pi/2$. [10]

Q11)a) Obtain the system function $H(z)$ and difference equation for $h(n) = \{1, -2, -2, 3\}$. Draw a direct form FIR filter structure. [8]

b) Compare DSP processor and general purpose processors. [8]

OR

Q12)a) What is the use of DAG1 and DAG2 in ADSP 21XX family? With example explain the use of various memory pointer registers of DAG1 and DAG2. [8]

b) Write a note on applications of DSP in image processing. [8]

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