Total No. of Questions : 12]

SEAT No. :

P2344

[Total No. of Pages : 4

[4758]-82

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 $X(e^{jw}) = 1$. **[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 $w_r = \pi/2$. **[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 DAGI and DAG2. **[8]**

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

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