

Total No. of Questions : 12]

SEAT No. :

P1417

[Total No. of Pages : 3

[4858] - 184

T.E. (Computer) (Semester - I)

DIGITAL SIGNAL PROCESSING

(2008 Pattern)

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) 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) $x(n) = \sin(\pi/4 n)$

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

b) What is Nyquist rate? Draw block diagram of ADC. [3]

OR

Q2) a) What is discrete time system? Explain any three classification of discrete time system with example. [13]

b) Define impulse response of a discrete time system. Show that $h(n) = 0$ for $n < 0$. [5]

P.T.O.

- Q3)** a) Compute circular convolution of the following sequence : [8]
 $x_1(n) = \{1, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$
 b) Obtain DTFT, magnitude and phase for $x(n) = u(n) - u(n - 4)$ [8]

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 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) What is mean by radix-2 FFT? Draw the 4-point radix-2 DIT FFT butterfly structure for DFT. [6]

OR

- Q6)** 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) 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 :
 i) $\delta(n)$ and ii) $u(n)$? Whether this system is stable? [8]
 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 advance property of unilateral Z transform. [8]

Q9) a) State the characteristics of ideal filter. What are the advantages and disadvantages of digital filter over analog filter. [10]

b) $H_a(s)$ is given as, $H_a(s) = \frac{1}{(s+1)}$ and $T_s = 1$ sec. Find $H(z)$ using bilinear transformation method and also write the difference equation of digital filter. [8]

OR

Q10) a) Determine the unit sample response of the ideal low pass filter. Why it is not realizable? [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) Write a note on applications of DSP in speech processing. [8]

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

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

