Total No. of Questions : 12]

SEAT No. :

P1417

[Total No. of Pages : 3

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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 $X(e^{jw}) = 1$. **[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, $Ha(s) = \frac{1}{(s+1)}$ 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 $\text{Ha(s)} = \frac{(s+0.1)}{(s+0.1)^2+16}$ Obtain the system function of the digital filter using bilinear transformation which is resonant at $W_r = \pi/2$. **[10]**

Q11) a) Write a note on applications of DSP in speech processing. **[8]**

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

OR

Q12) a) What is the use of DAG1 and DAG2 in ADSP 2IXX 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]**

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