[5560]-17
T.E. (Computer Engineering)
DIGITAL SIGNAL PROCESSING
(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

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

SECTION - I

Q1) a) State and explain the following properties of Discrete Time System. **[10]**

i) Stability

ii) Causality

iii) Time-Invariant

iv) Linearity

b) Obtain a Linear Convolution of DT signal **[8]**

$x(n) = h(n) = \{1,2,1\}$

OR

Q2) a) Determine the particular solution of the difference equation. **[10]**

$y(n) = 6y(n-1) - 4y(n-2) + x(n)$

when the forcing function $x(n) = 3^n;\ n \geq 0$ and zero elsewhere.

b) State whether the given signals are energy or power signals. Justify the answere. **[8]**

i) $x(n) = (0.8)^n u(n)$

ii) $x(n)=3^n;\ n<0$

P.T.O.

Q3) a) Compare DFT with DTFT. State and prove Linearity Property of DFT. **[8]**

b) Compute the four point DFT of the following sequence *x(n) = {2, 1, 2,1}*. **[8]**

OR

Q4) a) Explain the difference between FT, DTFT and DFT. **[8]**

b) Find the DFT of the sequence for N = 4. **[8]**

x(n) = 0.5 ; for $0 \le n \le 2$

= 0 ; otherwise

Q5) a) Prove the following properties of Z Transform. **[8]**

i) Differentiation in Z domain

ii) Convolution in time domain

b) Determine the pole zero plot for the system described by difference equation. **[8]**

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) - x(n-1)$$

OR

Q6) a) Define POC of Z Transform. State significance of ROC. Derive the relationship between Z Transform and Fourier transform. **[8]**

b) Determine the causal signal x(n) having the Z Transform **[8]**

$$x(z) = \frac{1}{(1+z^{-1})(1+z^{-1})^2}$$

SECTION - II

Q7) a) State and prove time property of unilateral Z-transform. **[8]**

b) Define a system function H(Z). Determine H(Z) and draw pole zero plot for the system below. **[10]**

$$y(n) + \tfrac{3}{4}y(n-1) + \tfrac{1}{8}y(n-2) = x(n) + x(n-1)$$

OR

Q8) a) Define system function H(z). How it is obtained from the general difference equation? How it describes the properties of DT system. **[8]**

b) How to detemine the causality and stability from H(z), illustrate this with one example. Obtain the impulse response for the same. **[10]**

Q9) a) What is the use of windowing? Explain the design steps of FIR filter using windowing method. **[8]**

b) Convert the Analog filter **[8]**

$$H(s) = \frac{4}{(s+1)(s+2)}$$

into Digital Filter using Bilinear Transformation for T = 1 sec.

OR

Q10)a) Define DT filter. What do you mean by a linear phase response? What is group delay? State the advantages and disadvantages of FIR filter over an IIR filter. **[8]**

b) Design an IIR Low Pass Butterworth filter using Impulse Invariant method for the following specifications **[8]**

Passband :$08 \leq |H(e^{jw})|$ for $|w| \leq 0.2\pi$

Stopband : $|H(e^{jw})| \leq 0.2$ for $0.6\pi \leq |w| \leq \pi$

Assume T = 1 sec.

Q11)a) Draw the functional diagram of ADSP 21XXDSP processor. Explain application of DSP in speech processing. **[8]**

b) Explain linear phase FIR filter structure and draw it for filter length M=5. **[8]**

OR

Q12)a) Obtain and realize direct a FIR filter and cascade form FIR filter structure for a system having h(n)={1,–3,5,–3} **[8]**

b) How image is represented by digital computer? Explain the application of DSP in image processing w.r.t image enhancement. **[8]**

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