[4658] – 154

Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
(2008 Course)
DIGITAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 100

Instructions *: 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

1. a) Define a different standard discrete time signals and prove that $\delta(n) = u(n) - u(n-1)$. **8**

   b) Test the system y(n) = x(n) u(n) for causality, linearity, stability and time invariance. **8**

OR

2. a) Determine wheteher systems are time invariant or variant : **10**
   i) $y(n) = x(n) - x(n-1)$
   ii) $y(n) = nx(n)$
   iii) $y(n) = x(-n)$
   iv) $y(n) = x(n) \cos \omega_0 n$
   v) $y(n) = |x(n)|$.

   b) Prove that the discrete time sinusoidal signal is periodic only if its frequency f_0 is rational **6**

3. a) State and prove following properties of FT **12**
   i) Linearity
   ii) Periodicity
   iii) Frequency shift.

   b) Compute DFT of the following sequence using linear transformation matrix x(n) = {0, 1, 2, 3}. **6**

OR

4. a) Find N-point DFT of $x(n) = a^n$ for $0 \leq n \leq N-1$. **6**

   b) Compare :
   i) DFT and DTFT
   ii) Circular convolution and linear comvolution. **8**

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

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5. a) Explain Radix-2 DIT FFT algorithm. **8**

   b) Find the Z-transform and ROC of the sequance :

   $x(n) = (-1/3)^n\ u(n) - (1/2)^n\ u(-n-1)$. **8**

OR

6. a) Define inverse z-transform. Explain any one method to calculate inverse z-transform. **8**

   b) Calculate DFT of the sequence $x(n) = \cos(\pi n/2)$ where $N = 4$ using DIFFFT algorithm. **8**

SECTION – II

7. a) How to determine the causality and stability from H(z) ? **4**

   b) Define system function H(Z). How it is obtained from the general difference equation ? **4**

   c) Find and draw magnitude, phase response of system function : **8**

$$H(Z) = \frac{z+1}{z(z-1)}$$

OR

8. a) With example, explain the method of simple geometric interpretation (Construction) to obtain the frequency response of DT system. **8**

   b) Determine impulse response of $y(n) = 2x(n) - x(n-1) - 3y(n-1) - 2y(n-2)$. **8**

9. a) Compare between FIR and IIR filters. State the ideal frequency response characteristics of DT filter. **8**

   b) Convert an analog filter with system function H(s) into digital IIR filter using impulse invariance method. **10**

$$H(s) = \frac{10}{s^2 + 7s + 10}$$

OR

10. a) Explain the design steps of FIR filter with example using windowing method. **8**

    b) Explain impulse invariance method for the design of IIR filters. What are the problems associated with this method ? **10**

11. a) Explain the direct form – I and direct form – II of IIR filter structure. **8**

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

OR

12. a) Explain different types of standard architecture for microprocessor. **8**

    b) Draw and explain in brief the cascade form of FIR filter structure. **8**

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