T.E. Sem VI (R) ETRX. 5/12/14.

DTSS

QP Code : 15150

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No.**1** is **compulsory.**
(2) Attempt any **four** questions out of remaining.
(3 Assume suitable **data** (with appropriate justification only) wherever **required.**

1. Answer any **four** :– **20**
   (i) LTI system is stable if its impulse response is absolutely summable. Justify your answer.
   (ii) List the advantages/disadvantages of DSP processor w.r.t. general microprocessors.
   (iii) Write the analysis and synthesis equation for DTFT, DFT & Z - Transform.
   (iv) How many complex addition and complex multiplication required to be performed to find DFT of 256 point signal using FFT algorithm ? Hence Justify advantage/disadvantage of FET algorith.
   (v) $x[n]=\{2,-1,\underset{\uparrow}{2},-3\}$ Express $x[n]$ in terms of it's even and odd components.

2. (a) Write one equation for each finite and infinite duration. **10**
   (i) Causal signal
   (ii) Anticausal signal
   (iii) Two sided signal
   in discrete time domain and plot the same.

   (b) $H[n]=\left\{1,-\frac{1}{2}\right\}$, Determine the frequency response. If H(n) is impulse **10** response of an filter then identify the type of filter based on its passed band.

3. (a) Explain correlation property of Z- Transform. Determine the cross correlation **10** sequence of z - Transform. Determine the cross correlation sequence $\gamma_{x1x2}(l)$ of $x_1[n]=\{1,2,3,4\}$ $x_2[n]=\{4,3,2,1\}$
   (b) A LTI system function is given as : **10**

$$H(z)=\frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$$

Determine h(n) if
   (a) The system is stable
   (b) The system is causal
   (c) The system is anticausal
Specify the ROC of H(z) in all cases.

TURN OVER

4. (a) A system has unit sample response h[n] given as 10

$$h[n]=\frac{-1}{4}\delta[n+1]+\frac{1}{2}\delta[n]-\frac{1}{4}\delta[n-1]$$

(i) Is the system BIBO stable ?
(ii) Is the system causal ?
(iii) Find magnitude, plot the same (magnitude response only)

(b) Explain overlap add and overlap save method for filtering of long data sequences. 10

5. (a) Develop DIFFET algorithms for decomposing the DFT for N = 6 10
(b) x[n] = {1, 0, 1, 0, 0, 0, 1, 1} find X(k) using DIT - FFT algorithm. 10

6. (a) $x_1[n] = \{1, 2, 3, 4\}$ 10
$x_2[n] = \{5, 6, 7, 8\}$
$x_3[n] = \{1 + j, 2 + 6j, 3 + 7j, 4 + 8j\}$
Find DFT of $X_1(k)$, $X_2(k)$ & $X_3(k)$ but computing DFT only once.

(b) List the two properties of twidde factor. Justify these properties using appropriate example with N = 8 (min data length) 10

7. Attempt any **four** :– 20
(1) Compare IIR and FIR system
(2) Application of DSP processors
(3) Geortzel Algorithm
(4) Mapping between s-plane and z-plane for stable systems.
(5) System classification.