JE – 792

V Semester B.E. (Electronics & Commu.) Degree Examination, June/July 2013
(Y2K6 Scheme)
EC 505 – DIGITAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 100

Instruction : *Answer* ***any five full*** *questions, choosing atleast* ***two*** *from* ***each*** *Part.*

PART – A

1. a) Let X (K) is the N-point DFT of sequence x (n)
   i) If x (n) = x (N – 1 – n)

   ST $X\left(\frac{N}{2}\right) = 0$ for N even

   ii) If x (n) = – x (N – 1 – n)
   ST X (0) = 0 for N-even. **10**

   b) Find linear convolution of x (n) = {2, 1} and h (n) = {1, 2} using DFT and IDFT. **10**

2. a) Derive the radix-2, DIF-FFT algorithm to compute DFT of 8-point sequence and draw complete signal flow graph. **10**

   b) Compute 8-point DFT of $x(n) = \cos\left(\frac{n\pi}{4}\right)$ for $0 \le n \le 7$ using DIT–FFT algorithm. **10**

3. a) Draw DFI, DFII, cascade and parallel form realization for the system
   y (n) + 0.1 y (n – 1) = 0.2 y (n – 2) + 3 x (n) + 3.5 x (n – 1) + 5 x (n – 2). **12**

   b) Realize DF structure with minimum number of multipliers for FIR filter

   $H(z) = \left(1 + \frac{1}{2}z^{-1} + z^{-2}\right)\left(1 + \frac{1}{4}z^{-1} + z^{-2}\right)$. **4**

   c) Compare Butterworth and Chebyshev filters. **4**

P.T.O.

4. a) Design Chebyshev digital filter using Bilinear transformation for the specifications

$0.8 \leq |H(\omega)| \leq 1$, for $0 \leq \omega \leq 0.2\pi$

$|H(\omega)| \leq 0.2$, for $0.32\pi \leq \omega \leq \pi$ **10**

b) Design digital filter equivalent using impulse invariance method with

T = 1 sec for analog filter $H(s) = \frac{2}{s^2 + 8s + 15}$. **10**

PART – B

5. a) Design a Band Pass filter in the range 1 to 2 rad/sec using Hamming window with N = 5. **10**

b) Design FIR filter using frequency sampling technique to pass frequencies between 1 KH and 3 KHz with sampling frequency 8 KHz and N = 7. **10**

6. a) Find and plot magnitude response of Rectangular window with N = 9. **10**

b) Design a differentiator for frequency response $H\left(e^{j\omega}\right) = j\omega$, for $-\pi \leq \omega \leq \pi$ using rectangular window with N = 7. **10**

7. a) Discuss basic operations in multirate signal processing with filters. **10**

b) Show that the interpolator and decimator are linear and time variant. **10**

8. a) With neat diagram explain architecture of TMS 320 C XX DSP processor. **10**

b) Explain different addressing modes used in TMS 320 C XX processor. **10**