JE – 770

VII Semester B.E. (Electrical and Electronics) Degree Examination, June/July 2013
(2K6 Scheme)
EE 704 : DIGITAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 100

Instruction : *Answer* ***any five full*** *questions.*

1. a) Find DFT of the sequence x (n) such that x (n) = 1 $0 \leq n \leq 2$
= 0 elsewhere

Plot $|X(k)|$ and < X (k) for N = 4. **8**

b) Consider the sequence $x(n) = 4\delta(n) + 3\delta(n-1) + 2\delta(n-2) + \delta(n-3)$. Let X (k) be 6 point DFT of x (n). Find the finite length sequence y (n) which has 6pt DFT $Y(k) = W_6^{4k} X(k)$. **8**

c) P.T. DFT of x (N – n) = X (N – k). **4**

2. a) For the sequence x_1 (n) = (2 1 1 2) and x_2 (n) = (1 –1 –1 1) compute
   i) Circular convolution of $x_1(n)$ and $x_2(n)$
   ii) Linear convolution of $x_1(n)$ and $x_2(n)$
   iii) What value of 'N' is needed so that linear and circular convolution yield the same result on N point interval. **8**

b) Derive Radix 2 algorithm for DIT FFT for N = 8. **8**

c) Write a note on chirp Z transforms. **4**

3. a) Find the 8 point DFT of (2, 1, 2, 1) using DIF – FFT. Draw signal flow graph with intermediate values. **10**

b) Derive the expression for N^{th} order and cut off frequency Ω_c for a butterworth filter starting from frequency domain specifications of low pass filter. **10**

4. a) Determine the order of a Chebyshev digital filter that meets the following specifications
   1) 1 db ripple in passband $0 \leq |\omega| \leq 0.3\pi$
   2) At least 60 db attenuation in shopband $0.35\ \pi \leq |\omega| \leq \pi$. **8**

b) Design a digital filter H (z) that when used in A/D – H (z) – D/A structure gives an equivalent analog filter with following specifications :

Passband ripple $\leq$ 3 db at passband edge = 500 hz shopband attenuation $\geq$ 15 db at shopband edge = 750 Hz sampling rate = 2 Khz. Filter is to be designed by performing bilinear transformation on an analog system. Use butterworth. **12**

5. a) Show that FIR filters have linear phase. **8**

b) Design a FIR linear phase digital filter using Hamming window with N = 7 and cut off frequency 0.2 π. **6**

c) Compare IIR and FIR filters. **6**

6. a) Realise the following forms of an IIR filter taking $H(z) = \frac{(z+1)(z+4)}{(z+3)(z+5)(z+2)}$

i) Direct form I
ii) Parallel form
iii) Direct form II. **10**

b) Realise an FIR filter having a linear phase with the following impulse response

i) $h(n) = \delta(n) + 2\delta(n-1) + 3\delta(n-2) + 2\delta(n-3) + \delta(n-4)$

ii) $h(n) = \delta(n) + \delta(n-1) + 2\delta(n-2) + 2\delta(n-3) + \delta(n-4) + \delta(n-5)$. **10**

7. a) Highlight the key features of CSX DSP processor as compared to general purpose processor. **6**

b) Explain with block diagram the architecture of TMS 320 processor and motorolla DSP 56000. **14**

8. Explain the following (**any four**) : **(5×4=20)**

i) Frequency transformation of Analog filter
ii) Kaiser window design of FIR filter
iii) Impulse Invariant design
iv) Frequency sampling design of FIR filter
v) Gibbs phenomena.