**JU – 864**

## V Semester B.E. (Electronics & Comm.) Degree Examination, Jan./Feb. 2014
## (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) Find N-point DFT of $x(n) = 5 + \sin^2\left(\frac{2\pi n}{N}\right)$. **10**

   b) Evaluate circular convolution for N = 8 using DFT and IDFT
   Given x(n) = u(n) – u(n – 4)
   h(n) = u(n) – u(n – 3). **10**

2. a) Derive the radix-2, DIT-FFT algorithm to compute 8-point DFT and write complete signal flow graph. **10**

   b) Compute 8-point DFT of x(n) = {1, 1, 1, 1, 0, 0, 0, 0} using DIF-FFT algorithm. **10**

3. a) Realize cascade and parallel structures for the system

   $$H(z) = \frac{(1+z^{-1})^3}{\left(1-\frac{1}{4}z^{-1}\right)\left(1-z^{-1}+\frac{1}{2}z^{-2}\right)}.$$ **10**

   b) Compare Butterworth and Chebyshev filters. **5**

   c) Obtain DF and cascade realization of FIR filter having system function

   $$H(z) = \left(1+\frac{1}{2}z^{-1}+z^{-2}\right)\left(2+\frac{1}{4}z^{-1}+2z^{-2}\right).$$ **5**

4. Design a digital Butterworth filter satisfying the following constraints $0.707 \le |H(\omega)| \le 1$, for $0 \le \omega \le \frac{\pi}{2}$ $|H(\omega)| \le 0.2$ for $\frac{3\pi}{4} \le \omega \le \pi$ with T = 1 sec. using

   i) Impulse invariance method and

   ii) The Bilinear Transformation. **20**

**P.T.O.**

PART – B

5. a) Design a High Pass filter using Hanning window for cutoff frequency 1.2 rad/sec with N = 7. **10**

   b) Design FIR filter using frequency sampling method for the response

$$H_d^{(e^{j\omega})} = \begin{cases} e^{-j3\omega}, & 0 \le |\omega| \le \dfrac{\pi}{2} \\ 0, & \dfrac{\pi}{2} \le |\omega| \le \pi \end{cases}.$$ **10**

6. a) Design an ideal differentiator with frequency response $H(e^{j\omega}) = j\omega$, for $-\pi \le \omega \le \pi$ using rectangular window with N = 7. Also plot magnitude response. **12**

   b) Find impulse response for given freqency response of FIR filter $H(e^{j\omega}) = e^{-j3\omega}\,[2+1.8\cos 3\omega + 1.2\cos 2\omega + 0.5\cos\omega]$. **8**

7. a) Discuss interpolator and Decimator with low pass filters. **10**

   b) State and prove linearity and time invariant properties of interpolator and decimator. **10**

8. a) Explain features of TMS 320 C XX processor. Also give applications of DSP processor. **10**

   b) Explain different addressing modes used in DSP processor. **10**

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