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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, March 2014
(2013 Scheme)
Branch : Electrical and Electronics Engineering
Streams : Power Control and Drives, Industrial Instrumentation and Control
EIC1002 : ADVANCED SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 60

Answer **any two** questions from **each** Module. **All** questions carry **equal** marks.

MODULE – I

1. Consider a length 10-point sequence defined as

   $x(n) = \{-3, 5, 45, -15, -9, 14, -8, 21, -10, 24\}$, with a 10-point DFT given by X(k).

   Evaluate the following functions of X(k) without computing the DFT.

   a) X(0) b) X(5) c) $\sum_{k=0}^{9} X(k)$ d) $\sum_{k=0}^{9} |X(k)|^2$

2. Draw the DIT-FFT flow graph for an 8-point DFT and obtain the DFT of the sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$

3. Implement the filter

$$H(z) = \frac{-0.512 + 0.64z^{-1} - 0.8z^{-2} + z^{-3}}{1 - 0.8z^{-1} + 0.64z^{-2} - 0.512z^{-3}}$$

using a lattice structure.

P.T.O.

MODULE – II

4. Design a FIR filter with the descred response

$$H_d(e^{j\omega}) = e^{-j3\omega}, \; |\omega| \leq \pi/4$$

$$= 0 \quad \pi/4 < |\omega| \leq \pi$$

Use Hanning window for the design.

5. An analog system function is

$H(s) = \dfrac{(s+0.1)}{(s+0.1)^2+9}$ is to be converted to a digital filter with resonant frequency $\pi/2$ using Bilinear transformation. Find the sampling interval T necessary to achieve this. Also obtain the corresponding digital filter. Realize the structure using direct form II.

6. a) A system is described as y(n) = 0.5 y(n – 1) + x(n), the range of input is (–1, 1) and represented by 5 bits. Compute the output noise power.

   b) What is meant by coefficient inaccuracy ?

MODULE – III

7. a) Prove that an upsampler is a linear time-invariant system.

   b) Explain short-time Fourier Transform indicating its features.

8. Consider a speech system with the following specifications :

   Speech input frequency range = 0-4 KHz,

   ADC resolution = 6 bits, Oversampling rate = 4 MHz.

   a) Draw a block diagram.

   b) Determine the actual ADC resolution (number of bits per sample).

9. With the help of internal architecture, explain the features of TMS C240 processor. Explain any 4 addressing modes of this processor. **(6×10=60 Marks)**
