C 58360 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2009

EC/AI/IC/BM 04 602—DIGITAL SIGNAL PROCESSING

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. (a) Explain the difference between :
   (i) Discrete Fourier series and DFT.
   (ii) Discrete Fourier transform and DFT.
   (b) What is meant by inplace computation ? Explain.
   (c) Explain the method for developing transposed form from direct from structures.
   (d) Explain errors due to rounding.
   (e) What are the advantages of FIR filters ? Explain.
   (f) What is meant by warping ? Explain.
   (g) What are the two types of special purpose hardware ? Explain.
   (h) What is replication ? Explain.

(8 × 5 = 40 marks)

Part B

2. (a) (i) State and prove convolution property of DFT. (7 marks)
   (ii) Explain split-radix FFT algorithm. (8 marks)

Or

   (b) (i) Derive decimation-in-frequency radix-2 FFT algorithm. (8 marks)
   (ii) Using FFT, find the DFT coefficients of $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$. (7 marks)

3. (a) Obtain direct form-I, direct form-II, cascade and parallel realization of the system described by the difference equation :

$$y(n) + \left(\frac{1}{6}\right) y(n-1) - \left(\frac{1}{6}\right) y(n-2) = 5x(n) - 2x(n-1).$$

Or

   (b) (i) Explain coefficient quantization in direct form realization of FIR filters. (12 marks)
   (ii) Explain what is meant by dead band. (3 marks)

Turn over

4. (a) (i) Derive the frequency response of linear phase FIR filter of length N (even) with anti-symmetric impulse response.

(7 marks)

(ii) Design a low-pass FIR filter with cut-off frequency 5 kHz using Hamming window function. Assume order of the filter N = 13.

(8 marks)

Or

(b) (i) Explain IIR filter design by approximation of derivatives. (6 marks)

(ii) Using impulse invariant mapping technique, convert the following analog system into digital system :

$$H(s) = \frac{1}{(s+0.5)\left(s^2+0.5s+2\right)}.$$

(9 marks)

5. (a) (i) Explain the special instructions in DSP-processor. (6 marks)

(ii) Draw the block diagram of architecture of a first generation fixed-point DSP processor and explain.

(9 marks)

Or

(b) (i) Explain hardware FFT processors. (6 marks)

(ii) Explain the implementation of IIR filtering by direct form structure. (9 marks)

[4 × 15 = 60 marks]