

**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 form 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 :

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

(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]