Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/CSE/SEM-8/CS-801C/2013

2013
DIGITAL SIGNAL PROCESSING

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct answers for the following : 10 × 1 = 10

   i) A voice signal is to pass a low-pass filter with a cut-off frequency 5000 Hz. The rate at which the signal should be sampled is

      a) 10,000 samples /sec

      b) 5,000 samples/sec

      c) 2,500 samples/sec

      d) none of these.

   ii) Typical application of Digital Signal Processing is

      a) Noise elimination

      b) Musical signal processing

      c) Image processing

      d) All of these.

   iii) For periodic time function, the frequency spectrum is

      a) Periodic b) Continuous

      c) Discrete d) Cannot be said.

iv) In a periodic pulse, if the length of its time period is successively increased, the signal approximates

a) Periodic signal b) Aperiodic signal

c) Complex signal d) Constant signal.

v) For a linear network, convolution integral provides the input-output relationship in

a) Time domain b) Frequency domain

c) Both of these d) Cannot be said.

vi) Maximally flat response is available in

a) Butterworth filter

b) Chebyshev filter

c) Elliptic filter

d) Bessel filter.

vii) IIR filter is used for

a) Linear phase characteristics

b) High speed calculation

c) Higher order filter implementation

d) Symmetrical property.

viii) Direct computation of 8-point DFT requires

a) 16 multiplications and 32 additions

b) 32 multiplications and 64 additions

c) 64 multiplications and 32 additions

d) 64 multiplications and 56 additions.

ix) For the computation of 16-point DIT-FFT , the number of required twiddle factors in the final stage is

a) 4 b) 6

c) 8 d) 16.

x) FIR filter is used for

a) High speed calculation

b) Implementation using fewer coefficients

c) Linear phase characteristics

d) Low amplitude characteristics.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) What is Convolution theorem ? 3

b) What is Convolution property of Impulse response ? 2

3. State the equation of DFT and explain the equation for 4-point DFT.

4. Define Twiddle factors and define its relation with N-point DFT/FFT.

5. Explain the basic difference between DFT and FFT. What computation stages are required for a 64-point DIT-FFT ?

3 + 2

6. Deduce the DFT of a constant signal.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain Linear time invariant system. 4

b) Explain recursive and non-recursive systems. 6

c) Explain periodicity and symmetry property of FFT. 5

8. a) Explain IIR system with the equation of transfer function. 7

b) Draw the structure of a 2nd order IIR filter. 8

9. a) Explain Z-transform for the sequence $x(n)$. 7

   b) What is region of convergence in Z-transform ? 3

   c) Define relation between Z-transform and DFT. 5

10. a) Draw the structure of a 2nd order FIR filter with equation. 10

    b) Explain symmetrical FIR filter. 5

11. Explain any *three* of the following : 3×5

    a) Bilinear transformation

    b) Butterworth filter

    c) Causal filter

    d) Decimation in frequency algorithm

    e) Coefficient computation of FIR filter.