



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*

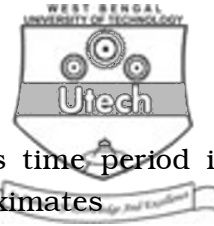
*The figures in the margin indicate full marks.*

*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 :  $10 \times 1 = 10$ 
  - 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
- High speed calculation
  - Implementation using fewer coefficients
  - Linear phase characteristics
  - Low amplitude characteristics.

### GROUP – B

#### ( Short Answer Type Questions )

Answer any *three* of the following.  $3 \times 5 = 15$

- What is Convolution theorem ? 3
  - What is Convolution property of Impulse response ? 2
- State the equation of DFT and explain the equation for 4-point DFT.
- Define Twiddle factors and define its relation with N-point DFT/FFT.
- Explain the basic difference between DFT and FFT. What computation stages are required for a 64-point DIT-FFT ?  $3 + 2$
- Deduce the DFT of a constant signal.

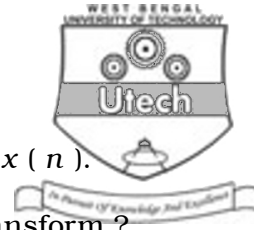
### GROUP – C

#### ( Long Answer Type Questions )

Answer any *three* of the following.  $3 \times 15 = 45$

- Explain Linear time invariant system. 4
  - Explain recursive and non-recursive systems. 6
  - Explain periodicity and symmetry property of FFT. 5
- Explain IIR system with the equation of transfer function. 7
  - Draw the structure of a 2nd order IIR filter. 8

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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.
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