



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (ECE)/SEM-2/MVLSI-202/2013

2013

DIGITAL SIGNAL PROCESSING & APPLICATIONS

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

Answer *all* the following questions.

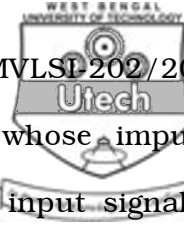
1. Answer the following questions : 4 + 2 + 4 + 2 + 2
 - a) What is the difference between linear and circular convolution ?
 - b) Utility of FFT and DFT.
 - c) Why 16-point DFT is preferable than 4-point DFT
 - d) If $x(n) = \{1, 0, 0, 1\}$, the DFT value $x(0)$ is ?
 - e) What is a power signal ?



GROUP – B

Answer any *four* of the following. $4 \times 14 = 56$

2. a) Determine the z-transform of the following sequence and its ROC, $x(n) = (n + 0.5) \frac{1}{3}^n u(n)$. 5 + 5 + 4
- b) Determine the DFT of the sequence $x(n) = \{0, 2, 4, 6\}$.
- c) Determine the direct form of realization of a linear phase FIR filter specified by the impulse response $h(n) = \{2, 4, 6, 6, 4, 2\}$ 5 + 5 + 4
3. Write short notes on the following : 5 + 5 + 4
- a) Causal and non-causal system.
- b) Overlap-add method and overlap-save method
- c) Butterworth filter.
4. a) Compute the 8-point DFT of the following sequence, $x(n) = \left\{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0 \right\}$. Use in-place radix-2 decimation in time FFT algorithm. 10 + 2 + 2
- b) What is a butterfly regarding FFT ?
- c) What are the difference and similarities between DIT and DIF algorithms ?



5. a) Determine the sectional convolution whose impulse response is $h(n) = \{1, 1, 1\}$ and input signal is $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using overlap-save method.

- b) Describe IIR low-pass filter design using bilinear transformation mode. 7 + 7

6. a) Find the system function and impulse response of the system described by the difference equation,

$$Y(n) = X(n) + 2X(n-1) - 4X(n-2) + X(n-3).$$

- b) Find the linear convolution using circular convolution for the sequences :

$$x(n) : \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\},$$

$$h(n) = \{1, 2\}$$

- c) What are the properties of the ROC ? Find the Z-transform and the ROC of the signal $X(n) = -b^n U(-n-1)$. 4 + 5 + 5
