



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (ECE-VLSI)/SEM-2/MVLSI-202/2011

2011

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.*

Answer all questions.

1. a) Compute 8 pt DFT of the sequence :

$x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using any FFT algorithm.

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

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

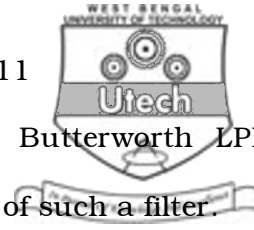
$h(n) = \{1, 2, 3\}$.

- c) Compute the circular convolution of the following two
sequences :

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

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

6 + 4 + 4



2. a) Sketch the magnitude response of Butterworth LPF filter & derive an expression for order of such a filter.

b) Design a digital Butterworth filter using the following specifications using impulse invariant method :

$$0.9 < H(j\omega) < 1 \quad \text{for} \quad 0 < \omega < 0.2\pi$$

$$H(j\omega) < 0.2 \quad \text{for} \quad 0.4\pi < \omega < \pi.$$

c) What are the advantages & disadvantages of bilinear transformation ? 5 + 5 + 4

3. a) The output and input of a recursive DT LTI system are related by the equation

$$y(n) = 0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2).$$

Derive and draw the direct form-II structure for realising the system.

b) Derive and sketch the cascade and parallel structure of the system with transfer function

$$H(z) = \frac{2(z+2)}{(z-0.1)(z+0.5)(z+0.4)}. \quad \text{5 + 9}$$



4. a) What is ROC ? State its properties.
- b) Find the system function & impulse response of the system described by

$$y(n) = x(n) + 2x(n-1) - 4x(n-2) + x(n-3).$$

- c) Find the inverse Z-transform of

$$X(Z) = Z(Z^2 - 4Z + 5) / (Z-3)(Z-2)(Z-1)$$

- d) Prove that an LTI system is BIBO stable if the ROC system function includes the unit circle. $2 + 5 + 4 + 3$

5. Write short notes on any *two* of the following : 2×7

- a) DIT algorithm
- b) Architecture of Digital Signal Processor
- c) Design of linear phase FIR filter
- d) Physical significance of Z-transform.

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