C 32072 (Pages 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2007

Information Technology

IT 2K 601—DIGITAL SIGNAL PROCESSING

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Explain about causality and stability of an LTI system.

(b) State and prove convolution property of Z-transform.

(c) Find the DFS of $x(n) = \{1, 2, 3, 0\}$.

(d) State and prove time shifting property of DFT.

(e) Compare IIR filter with FIR filter.

(f) Explain the linear phase characteristics of FIR filter.

(g) The input to the system $y(n) = 0.99\, y(n-1) + x(n)$ is applied to an ADC. What will be the power produced by quantization noise at the output of the filter of the input is quantized to 8 bits.

(h) Explain about overflow limit cycle oscillations.

($8 \times 5 = 40$ marks)

II. (a) Find the frequency response $H(w)$ and impulse response of a causal discrete time LTI system which is characterized by the difference equation $y(n) - \frac{3}{4}\, y(n-1) + \frac{1}{8}\, y(n-2) = 2x(n)$.

Or

(b) Obtain the Inverse Z-transform of $X(z) = \dfrac{z+2}{2z^2 - 7z + 3}$ by Partial fraction method and contour integration method for all possible ROCs.

(15 marks)

III. (a) Find the 8-point DFT of $x(n) = \{1, 2, 3, 4, -2, -2, 2, 2\}$ using DIF-FFT algorithm.

Or

(b) (i) Find the linear convolution of $x(n) = \{1, 2, 3\}$ with $h(n) = \{4, 5, 6, 7, 8\}$ using circular convolution,

(10 marks)

(ii) Explain the relation between DFT and z-transform. (5 marks)

Turn over

IV. (a) Design a digital Chebyshev filter for the following constraints using impulse invariant mapping.

$$0.707 \leq |H(w)| \leq 1, \quad \text{for} \quad 0 \leq w \leq \frac{\pi}{5}$$

$$0 \leq |H(w)| \leq 0.1, \quad \text{for} \quad \pi/2 \leq w \leq \pi$$

Or

(b) Design a digital high pass filter with cut off frequency at 0.4 rad/sec. The filter order is N = 9. Use Hanning window function.

V. (a) Obtain the cascade and parallel realization of the system having difference equation :

$$y(n) + 0.1y(n-1) - 0.72y(n-2) = 0.7x(n) - 0.252x(n-2).$$

Or

(b) Explain the effects of finite word length in FIR filters.

[4 × 15 = 60 marks]