D 42505 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2007

EE 04 702—DIGITAL SIGNAL PROCESSING

(2004 Admissions)

Time : Three Hours **Maximum : 100 Marks**

I. (a) Illustrate the properties of causality and time-variance with suitable example.

(b) Obtain the regular convolution of the sequences :

$x_1(u) = \{1, 2, 1, 2, 1\}$

$x_2(u) = \{0.\ 1.\ 2\}$

(c) What is the difference between DTFT and DFT ?

(d) Find the circular convolution of :

$x_1(u) = \{..... 1, 2, 3, 4, ...\}$ and

$x_2(u) = \{..... 1, 2, 3, 4, ...\}$, $N = 4$.

(e) Draw the direct form implementation of the following FIR filter :

$y(u) = x(u) - 2x(u-1) + 3x(u-2) - 10x(u-6)$.

(f) Derive an expression for the quantization error.

(g) Compare the advantages and disadvantages of passive and action filters.

(h) Why is the Butterworth response called a maximally flat response ?

(8 × 5 = 40 marks)

II. (a) If $y(u) = x(u) * u(u)$, show that :

$$\sum_{k_2 - \alpha}^{u} y(k) = \sum_{k_2 - \alpha}^{u} x(k) \sum_{k_2 - \alpha}^{u} u(k).$$

(15 marks)

Or

(b) Consider the second order difference equation :

$y(u) + ay(u-1) + by(u-2) = 0$.

Obtain all possible solutions of the equation.

(15 marks)

III. (a) With a help of an example, illustrate the overlap and add method of block convolution.

(15 marks)

Or

Turn over

(b) (i) Compute the 4-point DFT if the sequence $x(u) = \{1, 1, 1, 1\}$

(ii) Compute the N-point DFT of the sequence $x(u) = \delta(u)$.

(15 marks)

IV. (a) Explain with neat sketches the implementation of FIR filters in the :

(i) direct form.

(ii) lattice form.

(15 marks)

Or

(b) (i) Represent the following numbers in :—

(1) Fixed point format and

(2) Floating point format.

(a) 123.

(b) 34.64.

(ii) Explain the reasons for the popularity of DSP over other signal processing methods.

(15 marks)

V. (a) Design a Chebyshev filter for the following specifications :_

(i) pass-band gain required ; – 35 dB.

(ii) frequency upto which pass-band gain must remain more or less steady ; wc = 250 Hz.

(iii) Amount of attention required ; – 40 dB.

(iv) frequency from client attenuation must start ; w2 = 800 Hz.

(15 marks)