D 51340 (Pages 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2008

EE 04 702—DIGITAL SIGNAL PROCESSING

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

I. (a) Consider the system defined by the relation :

$$y(n) = ay\,(n-1) + x(n)$$

Given the initial condition $y(0) = 1$, find whether the system is (i) linear ; (ii) time variant.

(b) Convolve the following signals :

$$x(n) = \{1, 1, 1, 1, 1\}$$
$$\uparrow$$
$$h(n) = \delta(n) - \delta(n-1) + \delta(n-2) + \delta(n-3).$$

(c) Prove that convolution in frequency domain is equal to multiplication in time domain.

(d) Find the circular convolution of :

$x_1(n) = \{..., 1, 2, 1, ...\}$ and
$x_2(n) = \{..., 1, 3, 1, ...\}$, N = 3.

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

$$H(z) = 1 + 2z^{-1} + 3z^{-2} - yz^{-4} + 5z^{-5}.$$

(f) Give the features of floating point format.

(g) Distinguish between Passive and Active filters.

(h) What is frequency warping ?

(8 × 5 = 40 marks)

II. (a) (i) Test whether the following signal is periodic or not :

$$x(n) = 5\cos(n\pi/4) + 2\sin(3n\pi/4).$$

(ii) Find the circular slip $x\left[\left((n+1)\right)_3\right]$ of the sequence $x(n) = \{... 1, 1, 1, 1, ...\}$ N = 4.

(15 marks)

Or

Turn over

(b) Determine the zero input response of the system described by the homogeneous second-order differential equation $y(n) - 3y(n-1) - 4y(n-2) = 0$.

(15 marks)

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

(15 marks)

Or

(b) Explain the following :—

(i) Decimation in time FFT algorithms.

(ii) Decimation in frequency FFT algorithms.

(15 marks)

IV. (a) Obtain the filter coefficients of a 3-stage lattice structure FIR filter, from its equivalent third-order direct form structure whose coefficients are $a_0 = 1, a_1 = 11/8, a_2 = 7/8, a_3 = 1/4$.

(15 marks)

Or

(b) Discuss the applications of DSP in : (i) damage processing ; (ii) speech processing.

(15 marks)

V. (a) Compare the advantages and disadvantages of various window functions. (15 marks)

Or

(b) Design a low pass filter for the following specifications (Use bauser window) :

Frequency of pass band edge	=	300 Hz
Gain in pass band H_1	=	– 2dB
Frequency from which stop band begins	=	800 Hz
Gain (attenuation) in stop band, H_2	=	– 25 dB
Sampling frequency	=	3000 Hz

(15 marks)

[4 × 15 = 60 marks]