B.TECH. DEGREE VII SEMESTER EXAMINATION IN ELECTRONICS AND COMMUNICATION ENGINEERING
JUNE 2001

EC 701 DIGITAL SIGNAL PROCESSING

Time: 3 Hours Maximum Marks: 100

I. (a) Define z - transform of a discrete time signal. Find the z - transform of $f(t) = Cos\ \omega t$. (6)

(b) State and prove any two properties of z - transform. (8)

(c) Find inverse z transform of

$$X(z) = \frac{3 - \frac{5}{6}z^{-1}}{\left(1 - \frac{1}{4}z^{-1}\right)\left(1 - \frac{1}{3}z^{-1}\right)} \quad |z| > \frac{1}{3}. \quad (6)$$

OR

II a) Describe the important sequences used in digital signal processing. (8)

b) What is meant by time invariance? Check the filter given by the equation y(nT) = 2nT x (nT) for time invariance. (8)

c) Distinguish between causal and anticausal sequences. (4)

III a) Compute H(z) from $H_R(e^{jw}) = \frac{1 - \alpha \cos w}{1 - 2\alpha \cos w + \alpha^2}$, $|\alpha| < 1$ (10)

b) Define the convolution sum of a two dimensional sequence. State the condition for stability of a two dimensional system. (10)

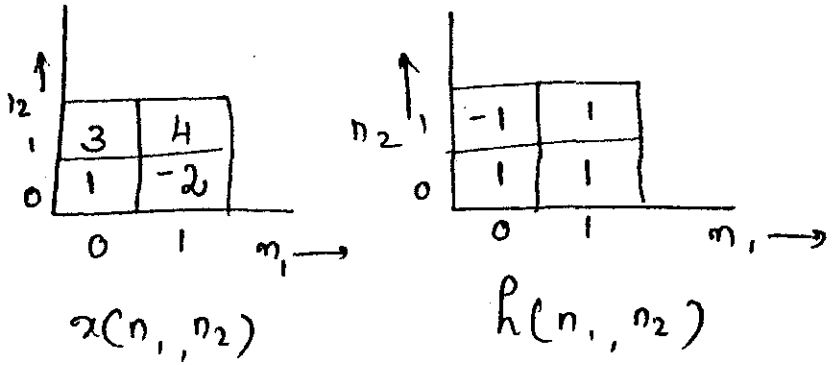
OR

IV a) Determine the frequency response of a 2-dimensional filter for which the unit sample response is

h(m, n) = 1 $|m| < M$ and $|n| < N$
0 otherwise (10)

(P.T.O)

b) Find the convolution of $x(n_1, n_2)$ and $h(n_1, n_2)$ where (10)



a) Distinguish between circular and linear discrete convolutions. (8)

b) Find the circular and linear convolutions of the sequences { 1, –1, 1, 1 } and {1, 2, 3, 4, 5 } (12)

OR

Find the 8 point DFT of the sequence

$$x(n) = 1 \quad -3 \le n \le 3$$
$$0 \quad \text{Otherwise}$$

using any radix - 2 algorithm. Draw flow graph and explain. (20)

I a) With the help of an example, explain the various schemes of realization of an FIR filter. (12)

b) A linear time invariant system has an output

$$y(n) = x(n) + \frac{1}{3}x(n-1) + \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2)$$

Identify the type of the filter and comment on its stability. (8)

OR

VIII a) Explain the windowing method for FIR filter design. Briefly describe the popular windows. (12)

b) Explain impulse invariance method and convert the analog system function $Ha(s) = \frac{s+0.1}{(s+0.1)^2+9}$ into digital filter using this method. (8)

IX a) Explain briefly the different types of arithmetic used in digital filters. Also explain the effect of quantisation on each type of arithmetic. (14)

b) Explain limit cycle oscillations. (6)

OR

X a) What is meant by coefficient inaccuracy error? (8)

b) With a basic block diagram explain the salient features of TMS 320 IC. (12)

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