B.Tech. Degree VII Semester Examination in Electronics and Communication Engineering, May 2002

EC 703 DIGITAL SIGNAL PROCESSING

(1998 Admissions)

Time: 3 Hours *Max. Marks: 100*

I a) Determine the Z-transform of the following signals.

(i) $x(n) = \cos\omega_o n \; u(n)$

(ii) $x(n) = a^n \; u(n)$ (10)

b) Prove that the convolution of two sequences in the time domain is equivalent to the product of their Fourier Transforms in the frequency domain. (10)

OR

II a) Define ROC in Z-transform and explain how does it relate to (i) Finite length sequence (ii) Right sided sequence and (iii) Two sided sequences. (10)

b) State and prove initial value theorem of Z-transform. (10)

III a) Explain shifting and circular convolution property of DFT. (10)

b) Find the DFT of the sequence { 1, -1, 1, -1 } using DIT FFT. (10)

OR

IV a) Explain how an FFT algorithm can be used to compute convolution. (10)

b) Explain (i) Bit reversal permutations.
(ii) In place computation with reference to FFT. (10)

V Given two sequences that are separable

$$A(n_1, n_2) = a(n_1)\, b(n_2)$$

$$B(n_1, n_2) = c(n_1)\, d(n_2)$$

(i) Show that their convolution is also separable.
(ii) Express the convolution in terms of a, b, c, d (20)

OR

VI a) What is the relation between DCT & DFT. (8)

b) If $\hat{x}(n)$ is the discrete Hilbert transform of a real sequence $x(n)$, show that $\hat{x}(n)$ may be obtained by filtering $x(n)$ with a frequency response $H(e^{sw})$

given by $H(e^{jw}) = \begin{cases} -j & ;0 \le w < \pi \\ j & ;\pi \le w < 2\pi \end{cases}$ (12)

VII a) Briefly discuss the s plane to z plane mapping by the Bilinear transformation. (10)

b) What are the advantages of this method? (10)

OR

VIII a) Design an analog filter that is equi ripple in the pass band and monotonic in the stop band. The pass band ripple is IdB upto the cut off frequency of 10 rad/sec. The attenuation should be atleast 20 dB down for a frequency larger than 40 rad/sec. (14)

b) Compare FIR and IIR filters. (6)

IX a) Distinguish between DSP processors and ordinary microprocessors, explaining The requirements of DSP processors. (10)

b) Discuss the architecture of any one TMS 320 processor with block diagram. (10)

OR

X a) Explain Harvard architecture of TMS 320 CXX processor. (12)

b) Write a brief note on the instruction set of TMS 320. (8)

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