A 1238

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Fifth Semester

Information Technology

IF 351 — DIGITAL SIGNAL PROCESSING

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between linear convolution and circular convolution.

2. What is the z-transform of discrete unit step function?

3. Why is the limit of the integral defined between $-\pi$ and $+\pi$ for the inverse Discrete Time Fourier Transform?

4. What do you mean by in-place computation in FFT?

5. List four important finite word length effects in digital filter implementation.

6. Draw the direct form I for a typical second order digital IIR filter.

7. Why is linear phase important in signal processing applications?

8. Write down the transfer functions of a first order Butterworth normalized lowpass filter and highpass filter respectively.

9. Mention two applications of multi rate digital signal processing.

10. What do you mean by 'Sub band coding'?

PART B — (5 × 16 = 80 marks)

11. Find the z-transform of

   (i) $x(n) = u(n) - u(n-1)$

   (ii) $x(n) = \left(\dfrac{1}{2}\right)^{|n|}$

12. (a) With butterfly diagram describe decimation in frequency 8 point radix-2 FFT.

Or

(b) Describe Inverse FFT for a radix-2 8 point frequency samples.

13. (a) (i) Find a direct form I and direct form II realisation of the filter. (8)

$$H(z) = \frac{1 - 2z^{-2} + 0.3z^{-3}}{1 - 0.2z^{-3}}$$

(ii) Compare fixed point arithmetic and floating point arithmetic. (8)

Or

(b) With suitable diagrams and expressions, describe quantization noise and the Round off effects in digital filters.

14. (a) (i) Design a second order normalized IIR lowpass digital filter for Butterworth frequency response. assume (T = 1 sec) (10)

(ii) Mention the properties of Butterworth filter. (6)

Or

(b) Design an ideal lowpass filter for a cut off frequency $w_c = 0.4$ rad using (8-tap) window design method.

15. (a) Describe down sampling and up sampling with appropriate examples.

Or

(b) Describe how multirate dsp concepts are applied to basic music processing.

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