

Reg. No. :

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Q 2325

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

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. What is a causal system? Give an example.
2. Find the Z' transform of unit step function.
3. List out four properties of DFT.
4. How many additions and multiplications are needed to compute N-point FFT?
5. Give the error range for sign magnitude and two's compliment of truncation and rounding.
6. What are the methods used to prevent overflow?
7. Distinguish between recursive and non recursive realization.
8. What are the desirable properties of the window technique?
9. What is meant by sampling rate conversion?
10. What is aliasing?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Determine the convolution of two sequences
 $x(n) = (3, 2, 1, 2)$, $y(n) = (1, 2, 1, 2)$ (8)

- (ii) Find the inverse Z transform of $X(z) = \frac{Z + 0.2}{(Z + 0.5)(Z - 1)}$ $Z > 1$ by using long division method. (8)

Or

- (b) (i) Check whether the following is linear, time invariant and causal (8)

$$y(n) = 3y^2(n-1) - nx(n) + 4x(n-1) - 2x(n+1).$$

- (ii) Determine the frequency response for the system given by (8)

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

12. (a) Find the DFT of a sequence $x(n) = (1, 1, 0, 0)$ and find IDFT of a sequence $Y(K) = (1, 0, 1, 0)$. (16)

Or

- (b) (i) Draw the butterfly flow graph of 8 point radix 2 Decimation-in-time FFT algorithm. (8)

- (ii) Compute 4 point DFT of a sequence $x(n) = (0, 1, 2, 3)$ using Decimation-in-frequency FFT algorithm. (8)

13. (a) (i) Develop cascade realization structure for (10)

$$y(n) = -0.1 y(n-1) + 0.2 y(n-2) + 3x(n) + 3.6 x(n-1) + 0.6x(n-2).$$

- (ii) Draw the Direct Form I realization structure for a third order IIR system. (6)

Or

- (b) (i) Determine the Direct Form realization of the following system function. (8)

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

- (ii) Obtain the cascade form realization of FIR system. (8)

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

14. (a) Explain the principle and procedure for designing FIR filter using rectangular window. (16)

Or

- (b) Design Butterworth filter using bilinear transformation method for the following specifications : (16)

$$0.8 \leq |H(e^{jw})| \leq 1; 0 \leq w \leq 0.2\pi$$
$$|H(e^{jw})| \leq 0.2 \quad 0.6\pi \leq w \leq \pi$$

15. (a) Explain in detail the two basic operations in multirate signal processing. (16)

Or

- (b) Write short notes on : (8 + 8)

(i) Sub band coding of speech signal

(ii) Digital filter bank.