



PART B — (5 × 16 = 80 marks)

11. (a) Find the Z-transform of the following discrete-time signals and find ROC.

$$(i) \quad x(n) = [-1/5]^n u(n) + 5[1/2]^n u(-n-1) \quad (8)$$

$$(ii) \quad x(n) = u(n-2) \quad (8)$$

Or

- (b) Find whether the following systems are

(i) Linear

(ii) Time invariant

$$(1) \quad y(n) = e^{-x(n)} \quad (8)$$

$$(2) \quad y(n) = x(n) \cos \omega n \quad (8)$$

12. (a) Find 8-point DFT of the sequence using radix-2 DIT algorithm.

$$x(n) = \{1, -1, -1, 0, 0, 0, 0\}$$

Or

- (b) Using radix 2 DIT-FFT algorithm, determine DFT of the given sequence for N=8

$$x(n) \left. \begin{array}{l} = n \text{ for } 0 \leq n \leq 7 \\ = 0 \text{ otherwise} \end{array} \right\}$$

13. (a) (i) Realize the following FIR system with difference equation $y(n) = 3/4y(n-1) - 1/8y(n-2) + x(n) + 1/3x(n-1)$ in direct form I. (6)
- (ii) Analyze briefly the different structures of IIR Filter. (10)

Or

- (b) Design a digital chebyshev filter using bilinear transformation satisfying the following constraints. Assume T = 1 Sec.

$$0.75 \leq |H(e^{j\omega})| \leq 1; \quad 0 \leq \omega \leq \pi/2$$

$$|H(e^{j\omega})| \leq 0.2; \quad 3\pi/4 \leq \omega \leq \pi$$

14. (a) Design an ideal band reject filter using Hamming window for the given frequency response. Assume $N = 11$

$$H_d(e^{j\omega}) = 1; \quad |\omega| \leq \pi/3 \text{ and } |\omega| \geq 2\pi/3 \\ = 0; \text{ otherwise}$$

Or

- (b) Design an FIR filter for the ideal frequency response using Hamming window with $N = 7$

$$H_d(e^{j\omega}) = e^{-j3\omega}; \quad -\pi/8 \leq \omega \leq \pi/8 \\ = 0 \quad ; \quad \pi/8 \leq |\omega| \leq \pi$$

15. (a) Discuss the application of DSP in image enhancement with few examples.

Or

- (b) Discuss the application of multirate signal processing in audio signal processing.