

9. What do you mean by, image enhancement?
10. State the advantages and disadvantages of digital signal processing compared to analog signal processing.

PART B — (5 × 16 = 80 marks)

11. (a) Check whether the systems described by the following equations are

(i) $y(n) = x(n)\cos(\omega_0 n)$

(ii) $y(n) = |x(n)|$

(iii) $y(n) = \text{sgn}[x(n)]$

Static or dynamic

Linear or non-linear

Shift invariant or shift variant

Causal or non-causal

stable or unstable.

(16)

Or

- (b) Compute the linear convolution of the following sequence using Mathematical Equation, Multiplication and Tabulation methods.

$$x(n) = \{0, 2, 2, 3\} \text{ and } h(n) = \sin\left(\frac{3\pi n}{8}\right), 0 \leq n \leq 4. \quad (16)$$

12. (a) (i) State and prove the periodicity and time reversal properties of DFT. (8)

(ii) Obtain the 4-point DFT of the following sequences.

(1) $x(n) = 2^n$

(2) $x(n) = \{0, 1, 0, -1\}$ (8)

Or

- (b) Compute the 8-point DFT of the equation $x(n) = n+1$ using Radix-2 DIF-FFT algorithm. (16)

13. (a) Determine the system function of the IIR digital filter for the analog transfer function

$$H_a(s) = \frac{10}{(s^2 + 7s + 10)} \text{ with } T = 0.2 \text{ second}$$

using impulse invariance method.

(16)

Or

- (b) A digital filter with a 3 db bandwidth of 0.25π is to be designed from the analog filter whose system response is

$$H_a(s) = \frac{\Omega_c}{s + \Omega_c}$$

using bilinear transformation and obtain $H(Z)$.

(16)

14. (a) Design the symmetric FIR low pass filter whose desired frequency response is given as

$$H_d(\omega) = \begin{cases} e^{-j\omega} & \text{for } |\omega| \leq \omega_c \\ 0 & \text{otherwise} \end{cases}$$

The length of the filter should be 5 and $\omega_c = 1$ radians/sample using Rectangular window.

(16)

Or

- (b) Realize a direct form and linear phase FIR filter structures with the following impulse response. Which is the best realization? Why? (16)

$$h(n) = \delta(n) + \frac{1}{3}\delta(n-1) - \frac{1}{4}\delta(n-2) + \frac{1}{3}\delta(n-3) + \delta(n-4).$$

- 1 (a) (i) Describe how various sound effects can be generated with the help of DSP. (8)
- (ii) Explain subband coding of speech and audio signals using DSP. (8)

Or

- (b) What is an adaptive filter? With neat block diagram discuss any four applications of adaptive filters. (16)