



PART B — (5 × 16 = 80 marks)

11. (a) Determine whether or not each of the following signals is periodic. If a signal is periodic specify its fundamental time period.

(i)  $x(t) = 2 \cos(3\pi t)$

(ii)  $x(t) = \sin(15\pi t) + \sin(20\pi t)$

(iii)  $x(n) = 5 \sin(2n)$

(iv)  $x(n) = \cos\left(\frac{n}{8}\right) \cos\left(\frac{\pi n}{8}\right)$ .

Or

- (b) Determine whether the following system is (i) static or dynamic (ii) linear or nonlinear (iii) shift invariant or not (iv) causal or noncausal (v) stable or unstable.

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

12. (a) (i) State and prove convolution theorem in Z transform. (8)

- (ii) Given  $x(n) = \delta(n) + 2\delta(n-1)$  and  $y(n) = 3\delta(n-1) + \delta(n) - \delta(n-1)$ , find  $x(n) * y(n)$  and  $X(Z) \cdot Y(Z)$ . (8)

Or

- (b) Find the Z-transform of

(i)  $\cos \omega_0 n \cdot u(n) = x_1(n)$

(ii)  $\sin \omega_0 n \cdot u(n) = x_2(n)$ . (16)

13. (a) (i) Determine the 8 point DFT of the sequence

$$x(n) = \{0, 1, 1, 1, 0, 0, 0\}. \quad (8)$$

- (ii) Find the Circular convolution of  $x_1(n) = \{1, 2, 3, 4\}$  and  $x_2(n) = \{4, 3, 2, 1\}$ . (8)

Or

- (b) Determine the 8 point DFT of the signal  $x(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$  and sketch its magnitude and phase. (16)

14. (a) Obtain the direct form I, direct form II, cascade and parallel form realization for the system

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

Or

- (b) Design an ideal Hilbert transformer having frequency response

$$H(e^{j\omega}) = j; \quad \text{for } -\pi < \omega < 0 \\ = -j; \quad \text{for } 0 < \omega < \pi.$$

Using (i) Rectangular window (ii) Blackman window for  $N = 11$ .

15. (a) (i) Find the effect of co-efficient quantization on the pole locations of the second order IIR system given by

$$H(Z) = \frac{1.0}{(1 - 0.5Z^{-1})(1 - 0.45Z^{-1})}$$

when it is realized in Direct form-I and in Cascade form. Assume a word length of 8 bits. (8)

- (ii) Explain the characteristics of a limit cycle oscillation with respect to the system described by the difference equation  $y(n) = 0.95y(n-1) + x(n)$ . Determine the dead band of the filter. (8)

Or

- (b) Give a detailed note on Direct Memory Access Controller in TMS320C54x processor. (16)