

Total No. of Questions : 8]

SEAT No. :

P-7566

[Total No. of Pages : 3

[6180]-80

T.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (303145B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be draw, wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of non-progameble calculator is allowed.

Q1) a) State and prove following properties of DTFT : [8]

- i) Linearity
- ii) Frequency shifting

b) For the sequence given below find the frequency response, plot magnitude and phase response for $\omega = -\pi$ to π with step size of $\frac{\pi}{3}$

$$h(n) = \delta(n) + \frac{1}{2}\delta(n-1) + \frac{1}{2}\delta(n+1). \quad [9]$$

OR

Q2) a) Explain the frequency response of first order system. [8]

b) Find the discrete-time Fourier transform of [9]

- i) $0.5^n u(n)$
- ii) $\delta(n-1) + \delta(n+1)$

iii) $\left(\frac{1}{3}\right)^n u(n-4)$

P.T.O.

- Q3) a)** Draw the structure of DIF-FFT algorithm for $N = 8$. [8]
b) Find the DFT of the sequence $x(n) = \{0, 1, 2, 3\}$. [9]

OR

- Q4) a)** State and prove the following properties of DFT : [8]
 i) Periodicity
 ii) Multiplication of two sequences
b) Find linear and circular convolution of following two sequences [9]
 $x_1(n) = \{1, 2, 3, 4\}$ and $x_2(n) = \{-1, -2, -3, -4\}$

- Q5) a)** State following statements are true or false with justification [6]
 i) To get correct information of any signal sampling frequency must be greater than twice maximum frequency present in the signal.
 ii) In filter realization, number of memory location required in direct form-II structure are less than direct form-I structure.
b) For the analog transfer function $H(s) = \frac{2}{(s+2)(s+1)}$. Determine $H(z)$ using bilinear transformation method. Assume $T = 1$ sec. [6]
c) Explain realization of IIR digital filters using direct form-II structure. [6]

OR

- Q6) a)** Obtain direct form-II realization for the system described by difference equation $y(n) = 0.5y(n-1) - 0.25y(n-2) + x(n) + 0.4x(n-1)$. [6]
b) Compare analog and digital filters. [6]
c) Explain impulse invariance transformation used in design of digital filters from analog filters. [6]

- Q7) a)** Design an ideal low pass filter with frequency response [12]

$$H_d(e^{j\omega}) = 1 \text{ for } -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2}$$

$H_d(e^{j\omega}) = 0$ for all other values of ω Find the values of $h(n)$ for $N=11$.s

- b)** Explain any one method used for measurement of voltage using DSP. [6]

OR

Q8) a) Obtain direct form realization of system function [6]

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

b) Differentiate between FIR and IIR filters. [6]

c) Write short note on “Application of DSP for harmonics measurement”. [6]
