

Total No. of Questions : 4]

SEAT No. :

P5038

[Total No. of Pages : 2

[6187]-438

T.E. (Electrical Engineering) (Insem)

DIGITAL SIGNAL PROCESSING

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

Time : 1 Hour]

[Max. Marks : 30

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable additional data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) a) Explain the analog-to-digital conversion process. **[5]**

b) Find the linear convolution of the following signals. **[10]**

i) $x(n) = \{2, 5, -3, -2\}$ and $h(n) = \delta(n-2) + 2\delta(n) - 3\delta(n-1)$

ii) $x(n) = \left(\frac{1}{2}\right)^n u(n)$ and $h(n) = \left(\frac{1}{5}\right)^n u(n)$

OR

Q2) a) Define following terms **[5]**

- i) Linear and nonlinear system
- ii) Static and dynamic system

b) Let $x(t)$ be the sum of sinusoidal signals **[10]**

$$x(t) = 6\cos(50\pi t) + 20\sin(300\pi t) - 10\cos(100\pi t)$$

where t is in milliseconds. Determine the minimum sampling rate that will not cause any aliasing effects, that is, the Nyquist rate. To observe such aliasing effects, suppose this signal is sampled at $(2/3)^{\text{rd}}$ of its Nyquist rate. Determine the signal $x_a(t)$ that would be aliased with $x(t)$.

P.T.O.

Q3) a) Explain stability of the system using z-Transform. [5]

b) Find the z-transform of the following signals with ROC [10]

i) $x(n) = \{2, -3, 4, 0, 1\}$

ii) $x(n) = \left(\frac{1}{2}\right)^n u(n) + \left(\frac{2}{3}\right)^n u(-n-1)$

OR

Q4) a) State and prove time reversal property of z-transform. [5]

b) Find the system function and impulse response of the system described by the difference equation [10]

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

State whether the system is stable or not?
