



AL- MUSTAQBAL UNIVERSITY COLLEGE
DEPARTMENT OF BIOMEDICAL ENGINEERING

Digital Signal Processing (DSP)

BME 312

Lecture 7

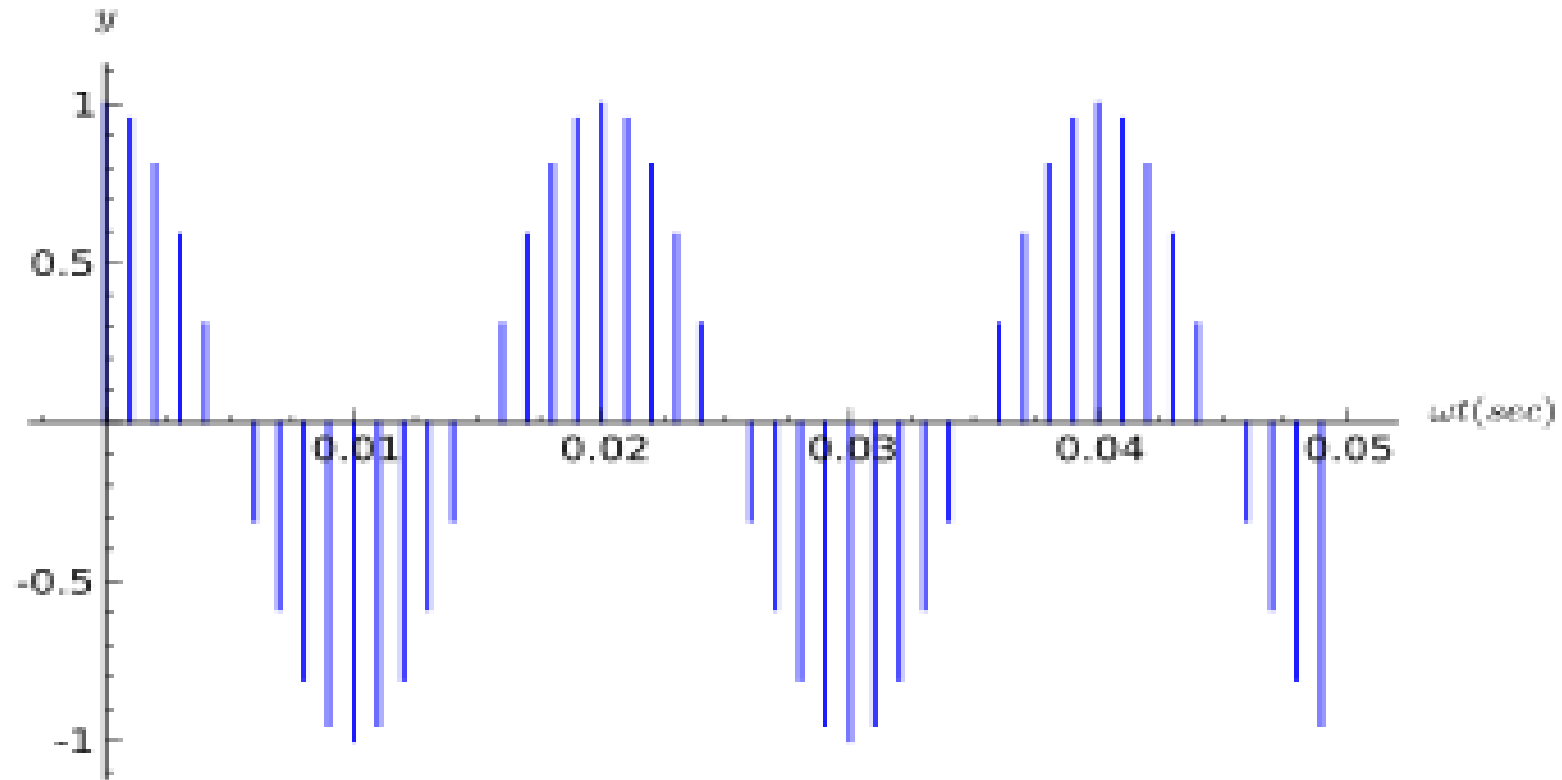
- Discrete Time Signals -

Dr. Zaidoon AL-Shammari

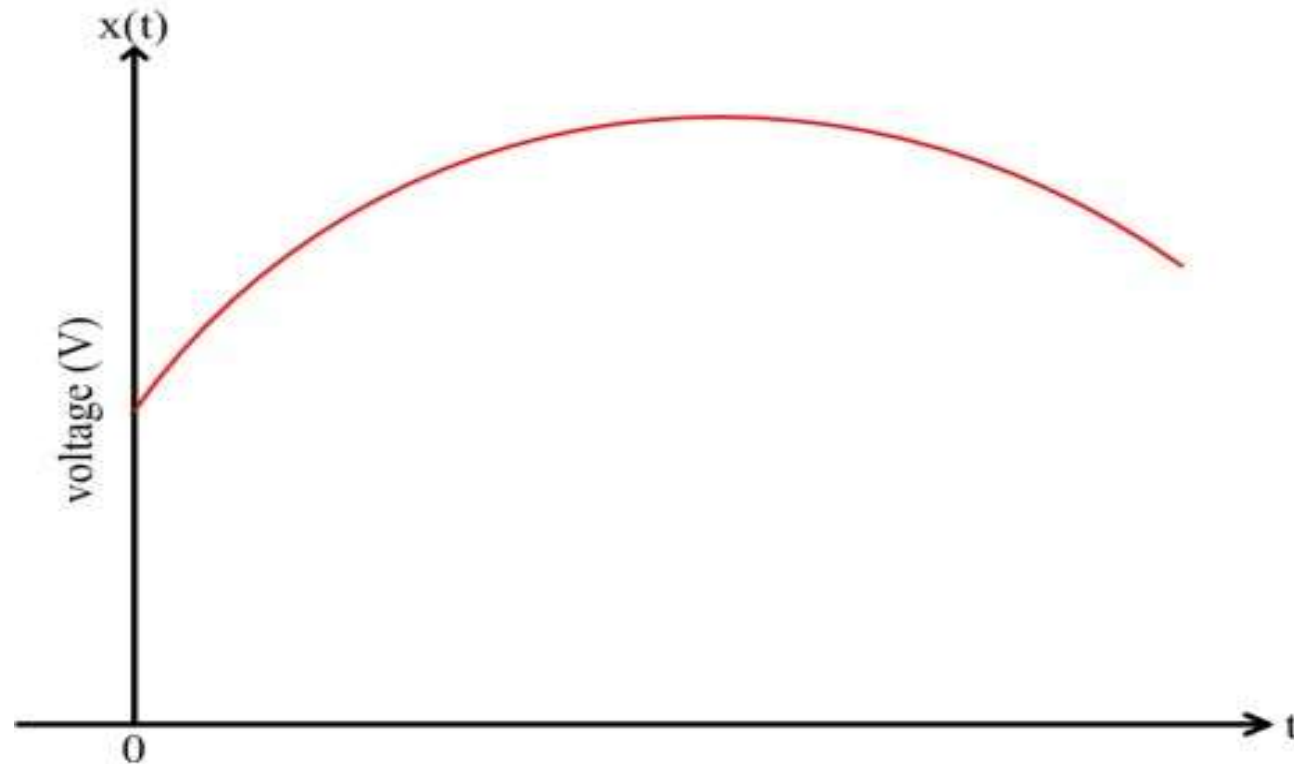
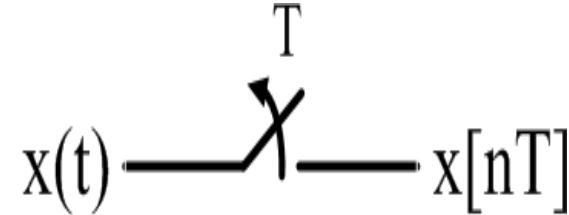
Lecturer / Researcher

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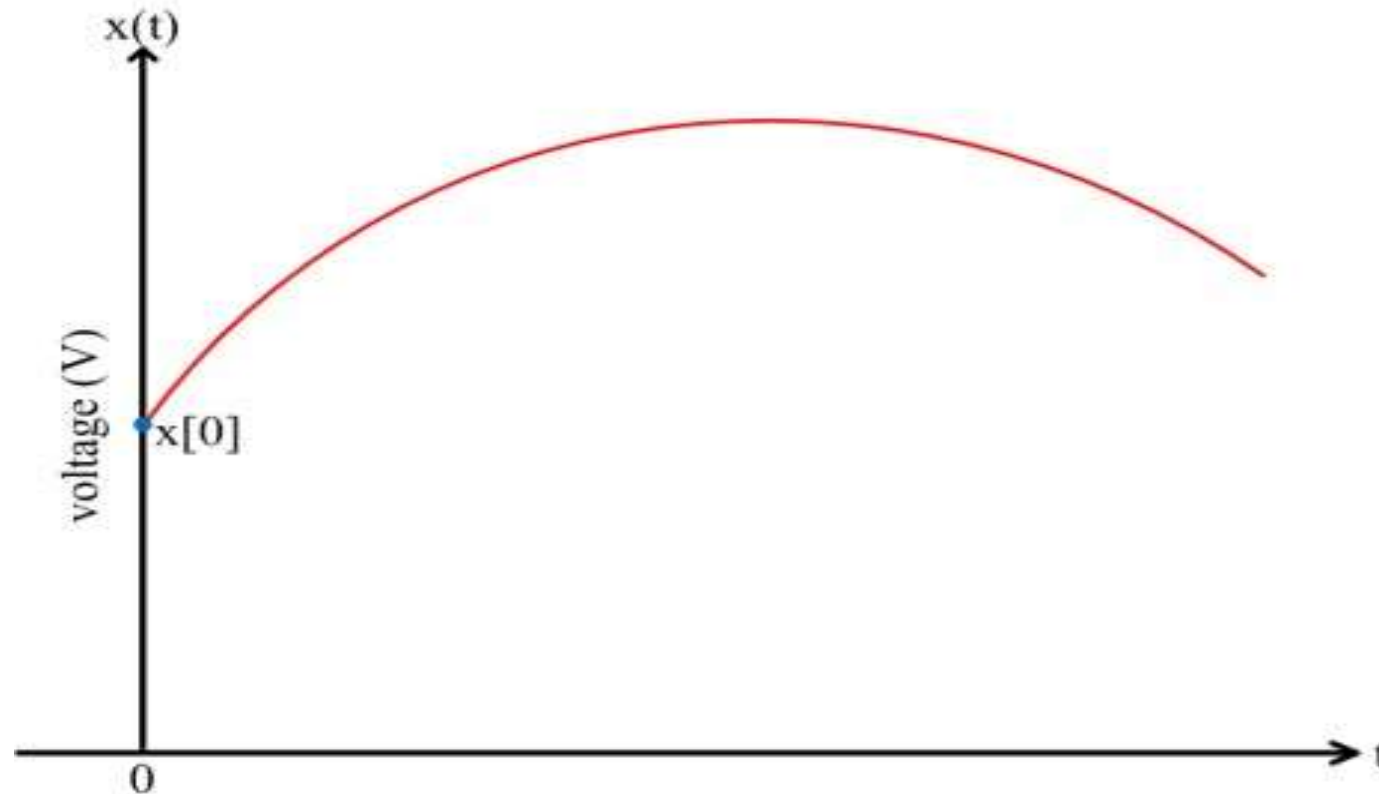
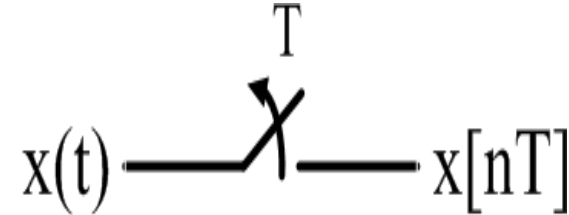
Discrete Time Signals



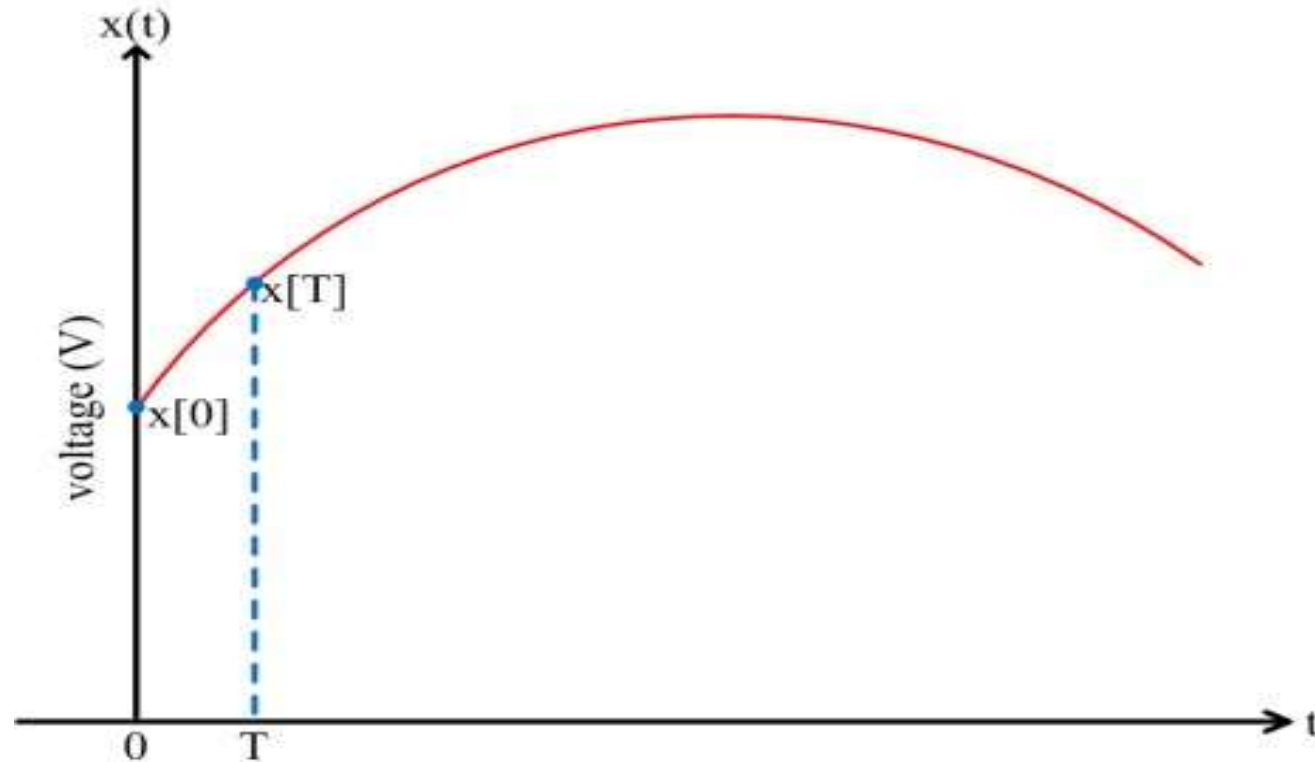
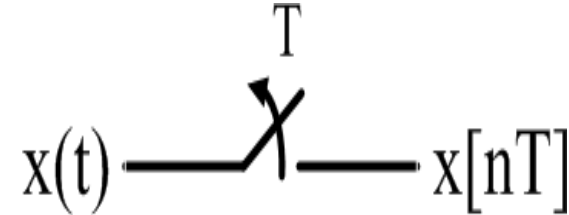
Sampling Process



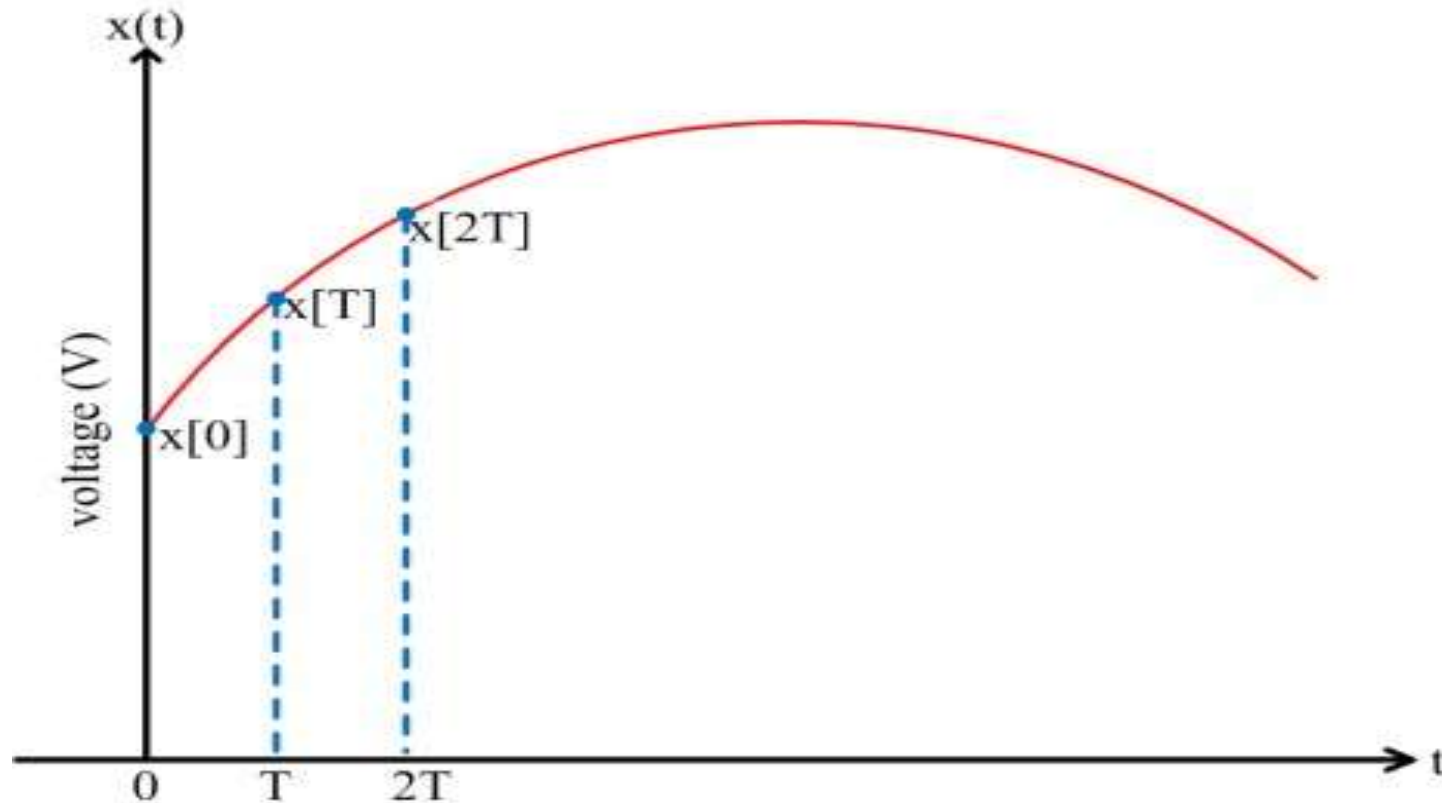
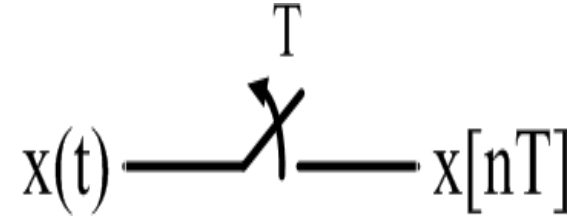
Sampling Process



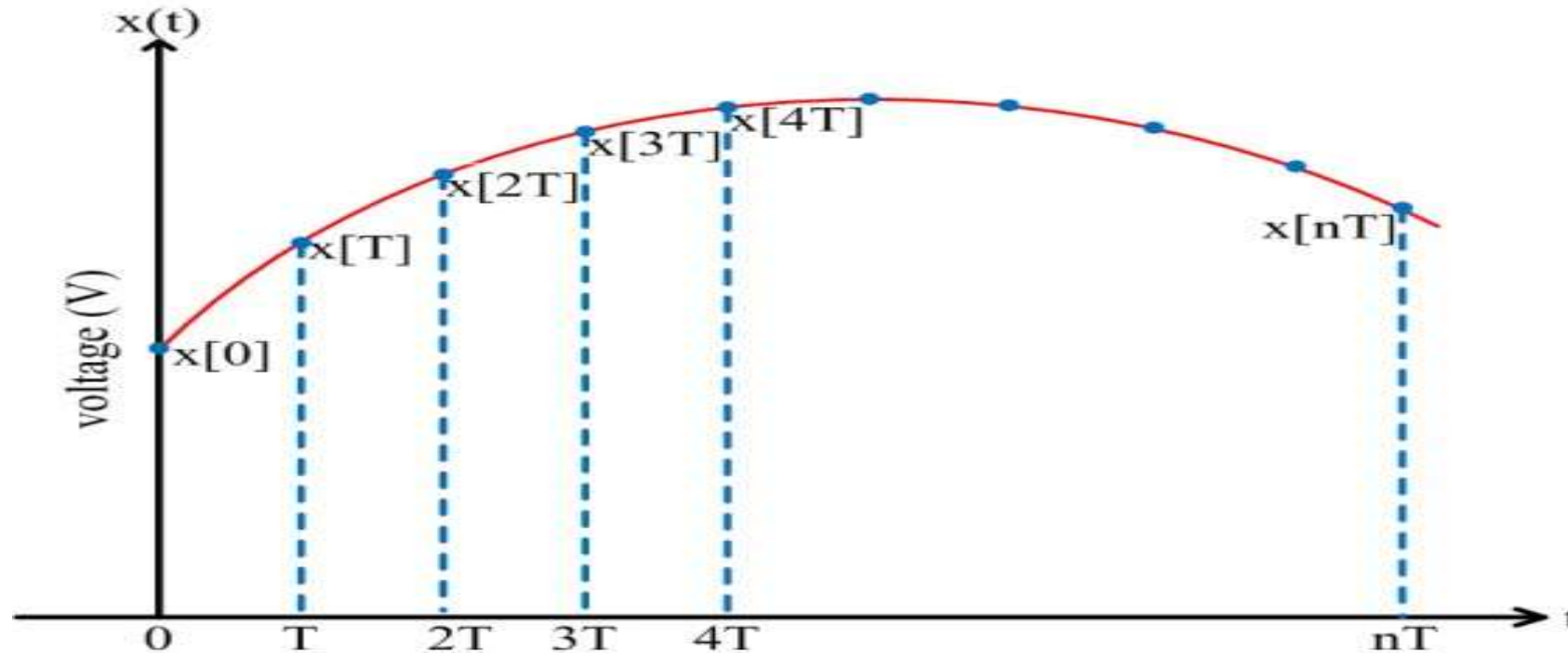
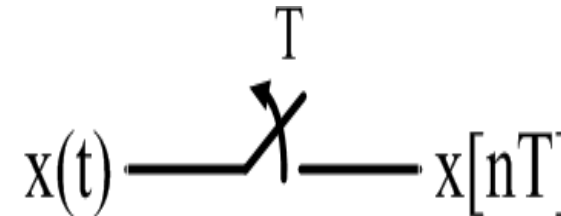
Sampling Process



Sampling Process

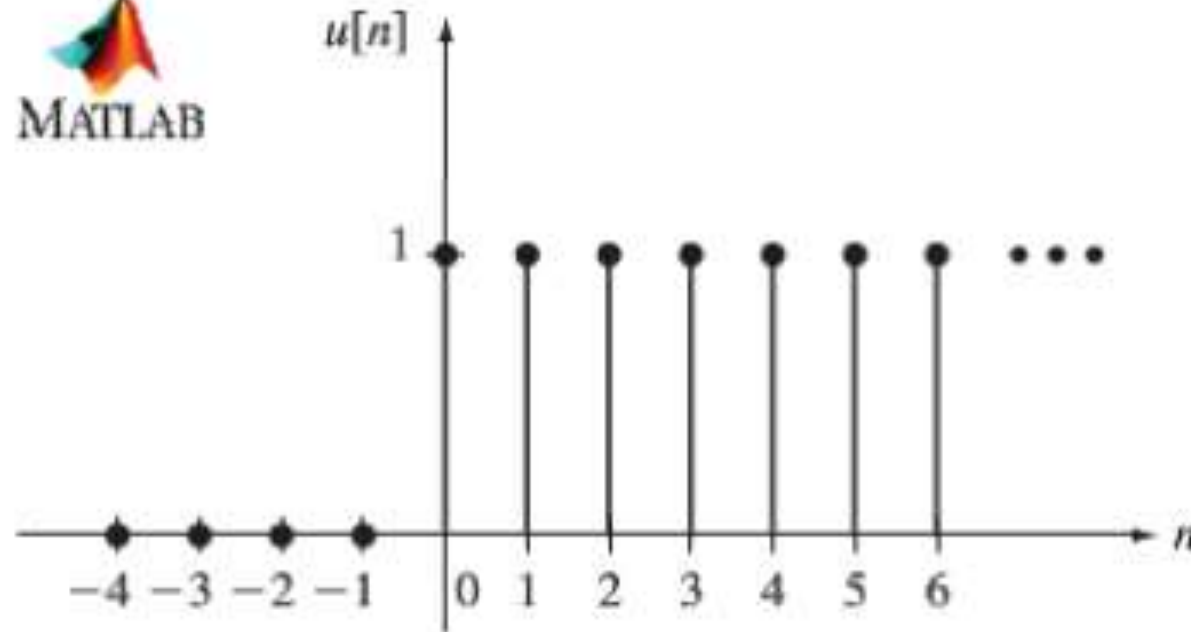


Sampling Process



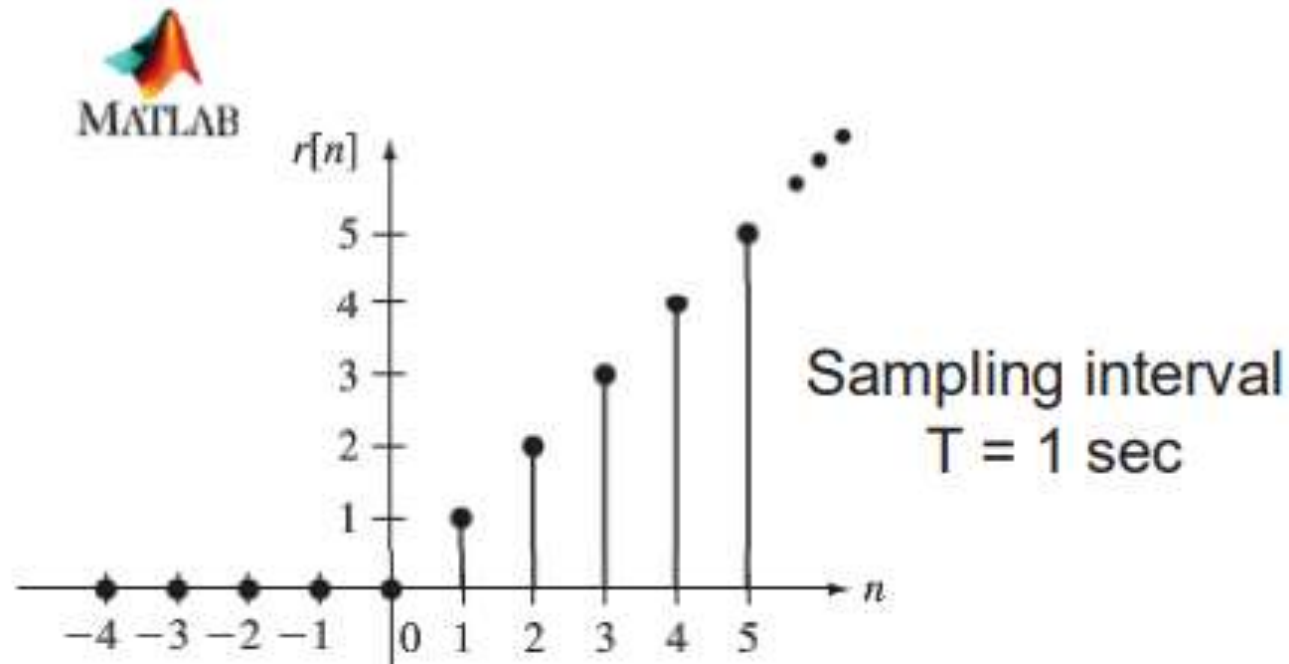
$$x[nT] = \{x[0], x[T], x[2T], \dots, x[nT]\}$$

Unit - Step Function $u(n)$



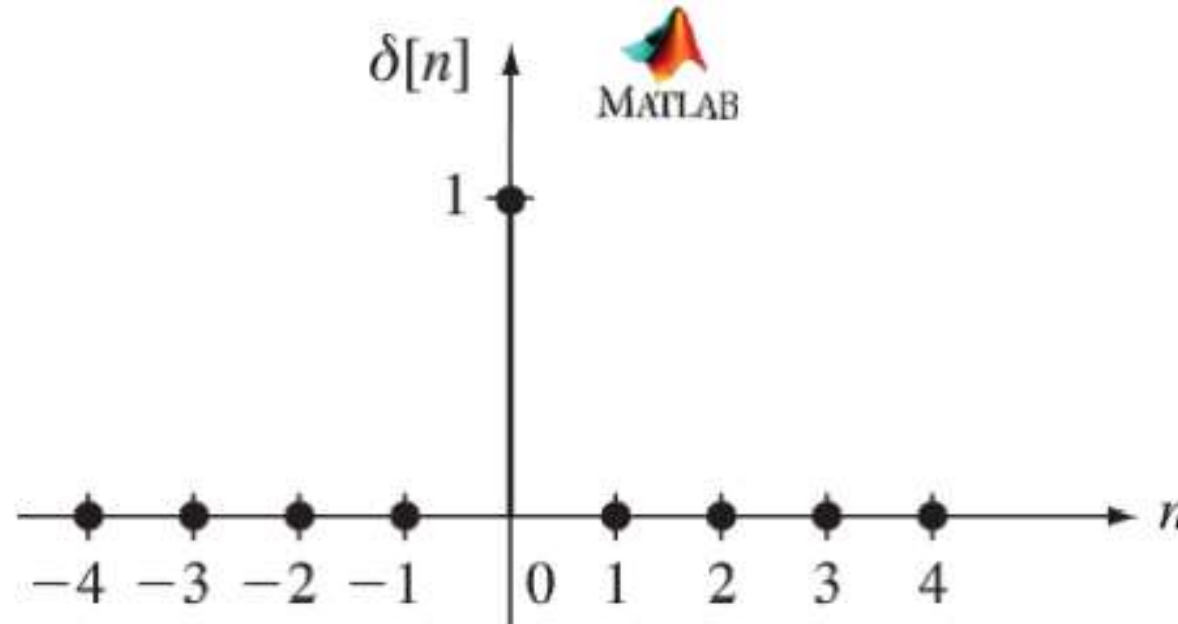
$$u[n] = \begin{cases} 1, & n = 0, 1, \dots \\ 0, & n = -1, -2, \dots \end{cases}$$

Unit - Ramp Function $r(n)$



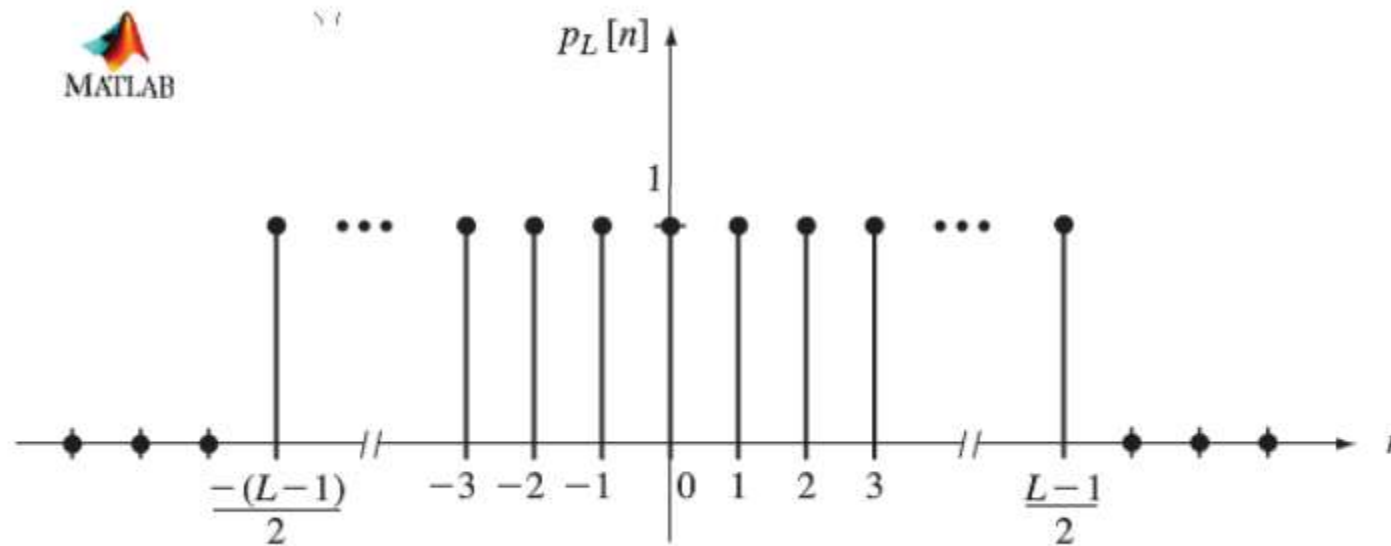
$$r[n] = \begin{cases} n, & n = 0, 1, \dots \\ 0, & n = -1, -2, \dots \end{cases}$$

Unit Impulse Function



$$\delta[n] = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases}$$

Rectangular Pulse Function

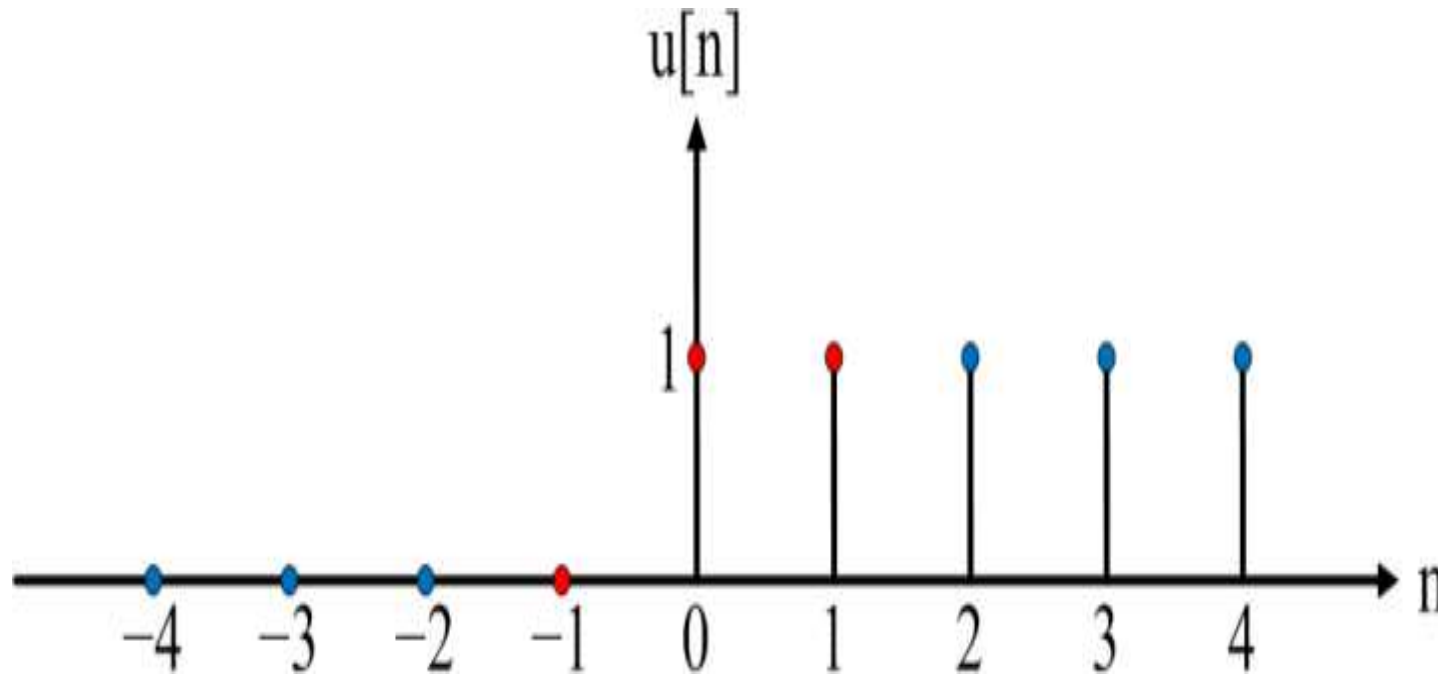


$$p_L[n] = \begin{cases} 1, & n = -(L-1)/2, \dots, -1, 0, 1, \dots, (L-1)/2 \\ 0, & \text{all other } n \end{cases}$$

Example 1



Determine the values of $u[-1]$, $u[0]$ and $u[1]$.

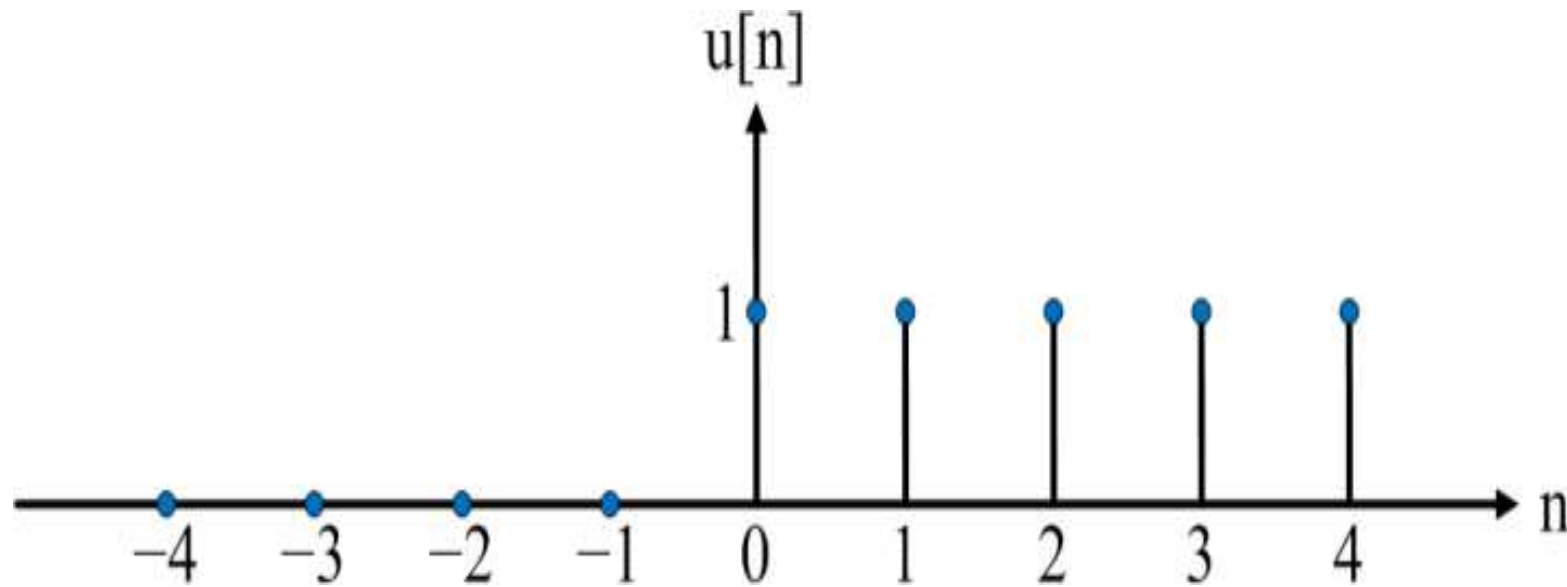


$$u[-1] = 0, u[0] = 1 \text{ and } u[1] = 1$$

Example 2



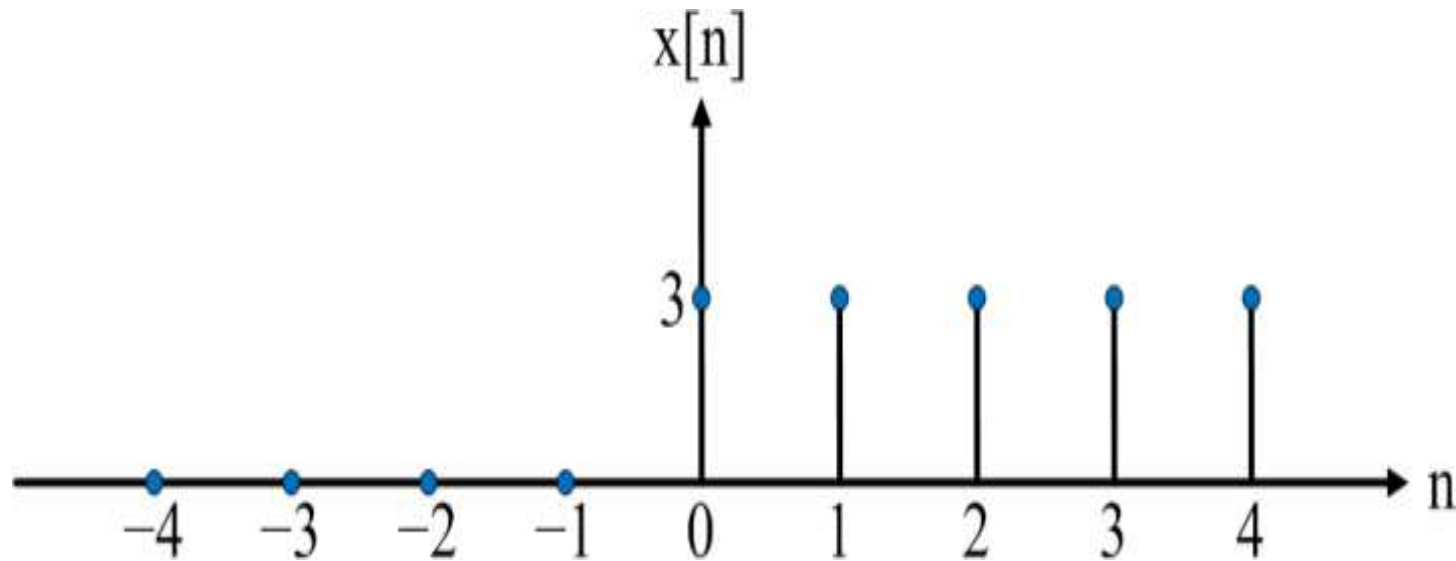
$$x[n] = u[n]$$



Example 3



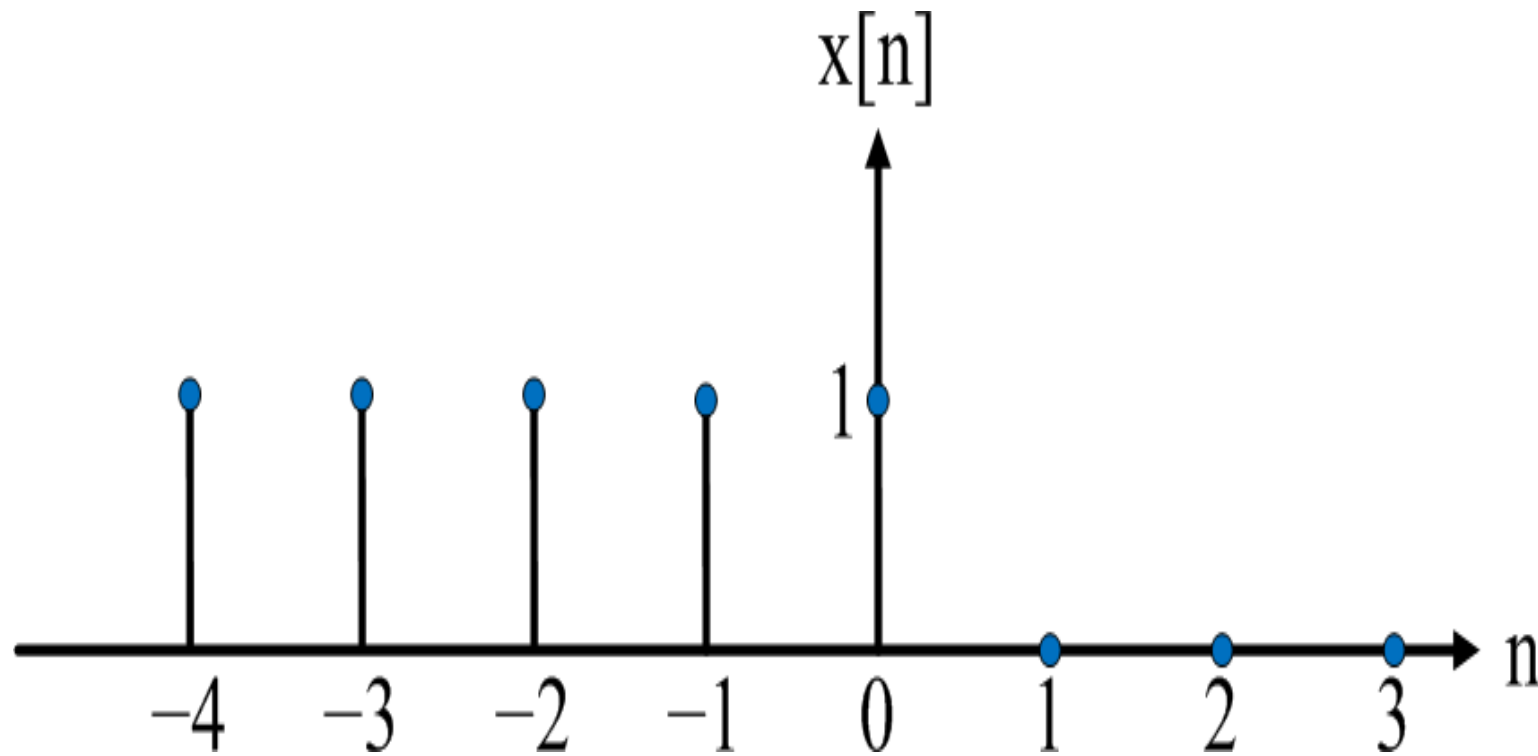
$$x[n] = 3u[n]$$



Example 4



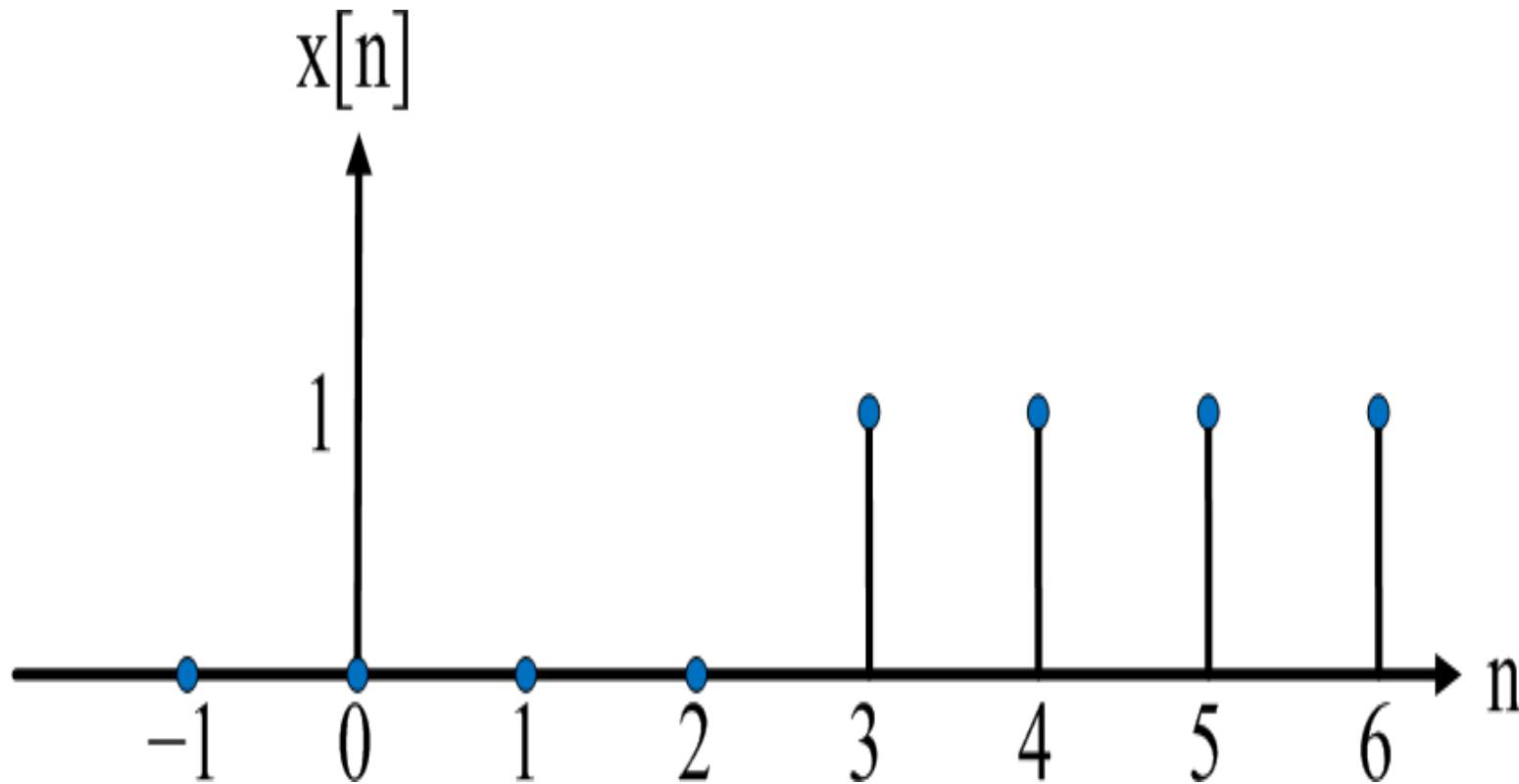
$$x[n] = u[-n]$$



Example 5



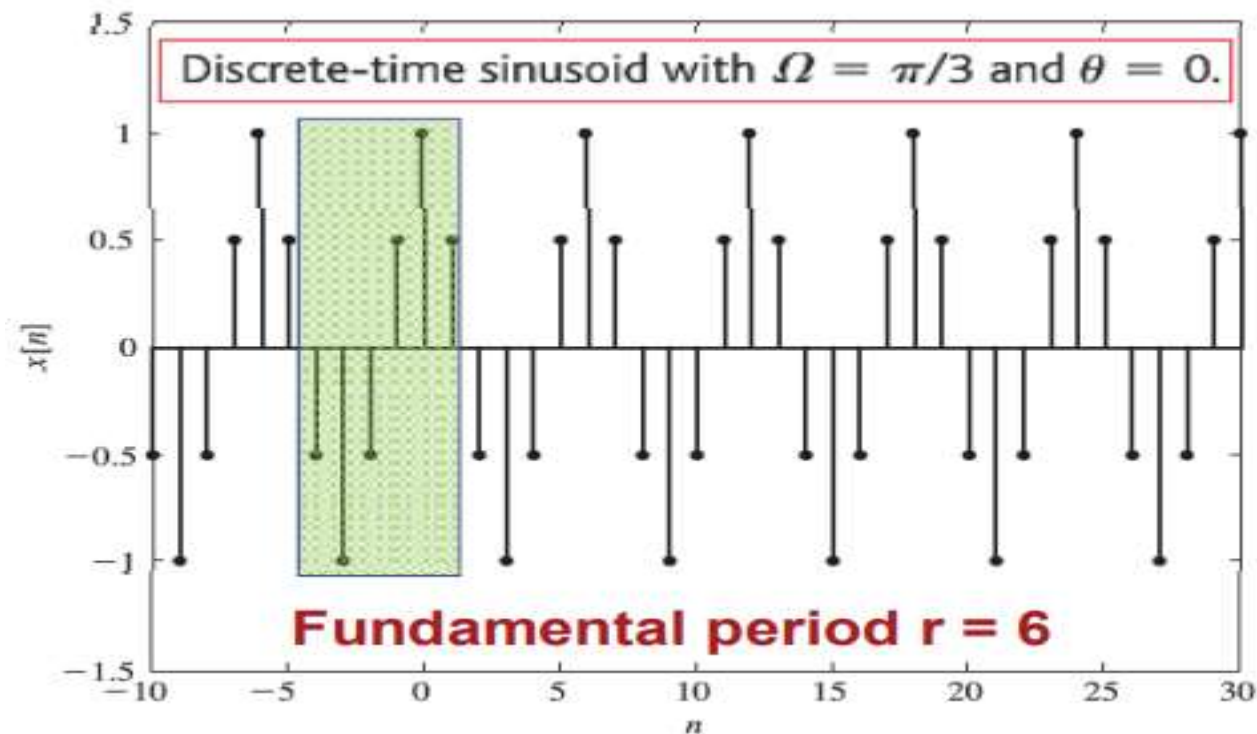
$$x[n] = u[n - 3]$$



Example 6



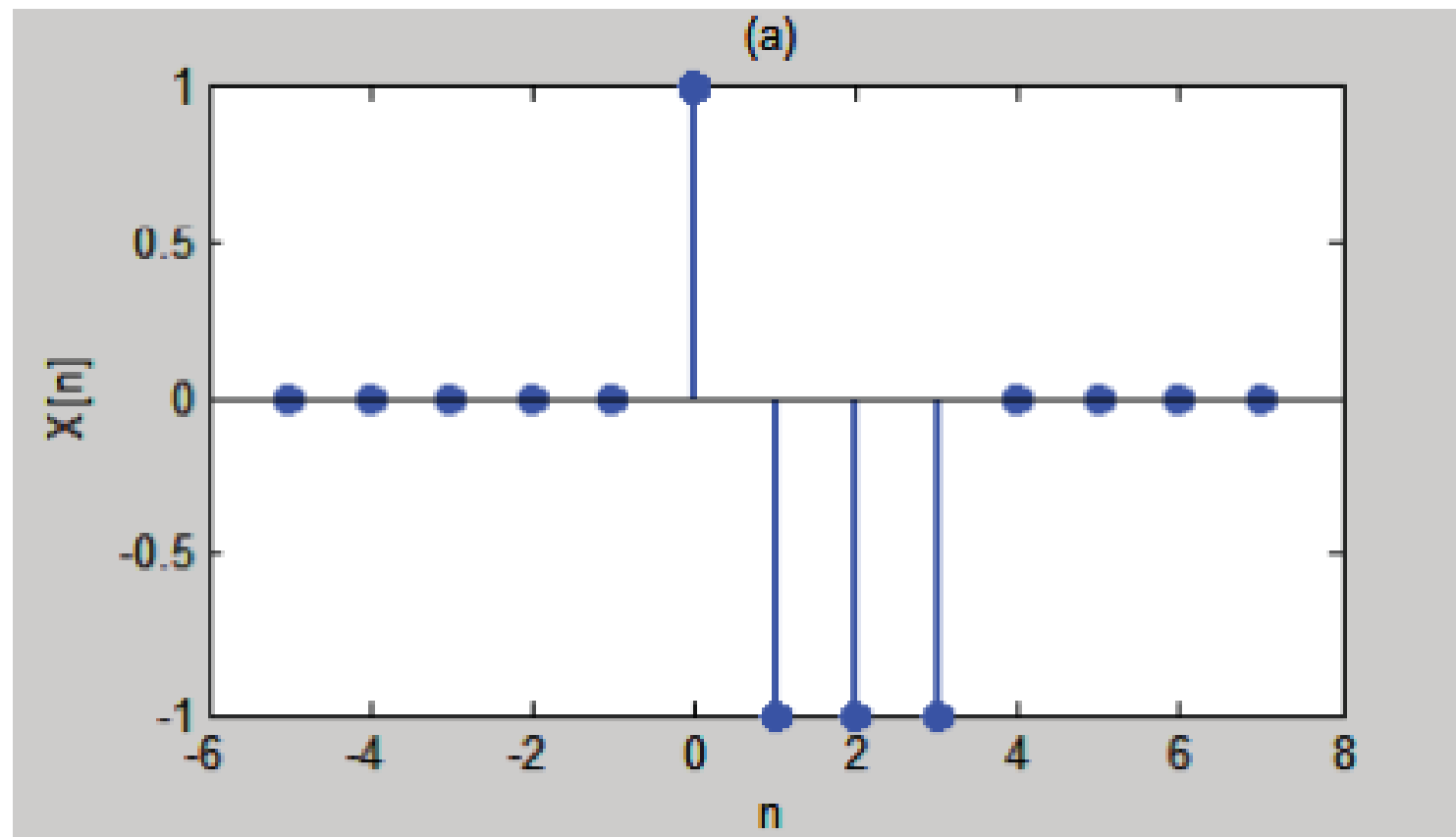
$$x[n] = A \cos(\Omega n + \theta)$$



Example 7



$$x[n] = u[n] - 2u[n - 1] + u[n - 4]$$



Example 8



$$x[n] = \begin{cases} 1, & -4 \leq n \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

