

# Signals and Systems (BEC 403)

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## Unit-5

### Sampling and Reconstruction of Signals

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# Chapter 1

## Sampling

### <sub>1</sub> 1.1 Syllabus:

<sub>2</sub> Sampling, reconstruction

### <sub>3</sub> 1.2 Kth Order Hold

<sub>4</sub> The rectangular function is given by

$$\text{rect}(t) = \begin{cases} 0 & \text{if } |t| > \frac{1}{2} \\ \frac{1}{2} & \text{if } |t| = \frac{1}{2} \\ 1 & \text{if } |t| < \frac{1}{2}. \end{cases} \quad (1.1)$$

<sub>5</sub> The triangular function is defined as

$$\text{tri}(t) = \begin{cases} 1 - |t|, & |t| < 1 \\ 0, & \text{otherwise} \end{cases} \quad (1.2)$$

<sub>6</sub> It is the convolution of two identical unit rectangular functions:

$$\text{tri}(t) = \text{rect}(t) * \text{rect}(t) = \int_{-\infty}^{\infty} \text{rect}(\tau) \cdot \text{rect}(t - \tau) d\tau \quad (1.3)$$

<sub>7</sub> Zero-order hold is given by:

$$x_{\text{ZOH}}(t) = \sum_{n=-\infty}^{\infty} x(n) \text{rect}(t - n) \quad (1.4)$$

8 for First-order hold

$$x_{\text{FOH}}(t) = \sum_{n=-\infty}^{\infty} x(n) \text{tri}(t - n) \quad (1.5)$$

9 for First-order hold. Since  $\text{tri}(t) = \text{rect}(t) * \text{rect}(t)$ , I would like to know if this  
10 is just a coincidence or if, for the Second-order hold the impulse response is

$$\text{tri}(t) * \text{tri}(t) = (\text{rect}(t) * \text{rect}(t)) * (\text{rect}(t) * \text{rect}(t)). \quad (1.6)$$

11 k times.