Eskişehir Osmangazi University, Faculty of Engineering and Architecture
Department of Electrical Engineering & Electronics, "*Communications*" Midterm   25.04.2023

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Let the signal $x(t)$ be the rectangular pulse representation of the binary stream $b[n]$ where binary 0 is represented by -1 and binary 1 is represented by +1. Rectangular pulse width is T_b. $b[n]$ is obtained by serializing *bcd* codes of last 2 digits of your student id. Determine which of the following waveforms is more similar to $x(t)$ using the cross-correlation approach.
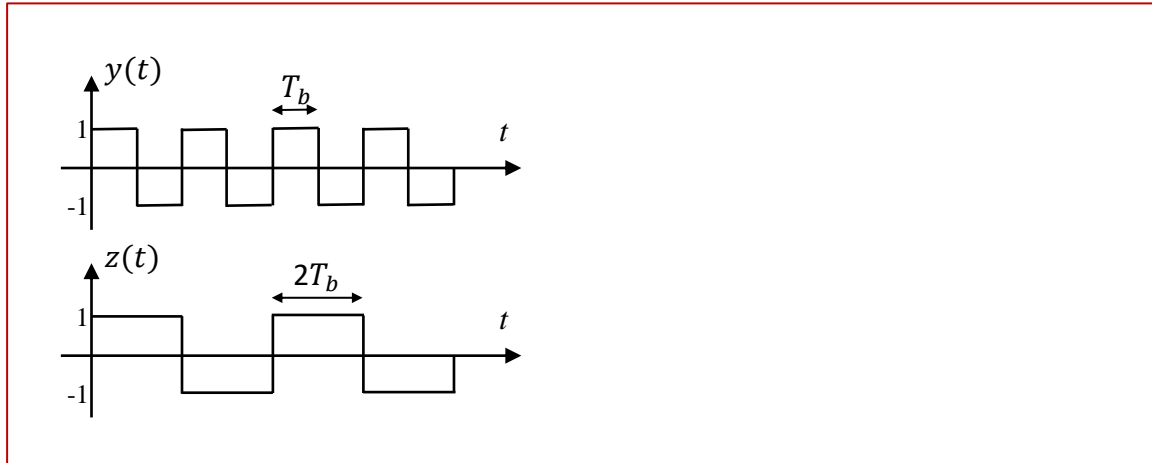
An example solution:
Highest correlation values will occur when pulse positions match for 8 pulses. In that case, the correlation for comparison can be performed over binary streams. That is, we can check correlations for y[n]={1,-1,1,-1,1,-1,1,-1} and z[n]={1,1,-1,-1,1,1,-1,-1}
Let us assume that the last two digits of your *studentid* are 25. Pulse coded *bcd* code is then $b[n]$={-1,-1,1,-1,-1,1,-1,1}.
Calculating correlations using
   $R_{by} = T_b \sum_{i=0}^{7} b[n]y[n]$ and $R_{bz} = T_b \sum_{i=0}^{7} b[n]z[n]$
we find
$R_{by} = T_b(-1+1+1+1-1-1-1-1) = -2T_b$ and
$R_{bz} = T_b(-1-1-1+1-1+1+1-1) = -2T_b$.
With these example results we can say that $x(t)$ is equally similar to $z(t)$ and $y(t)$.