

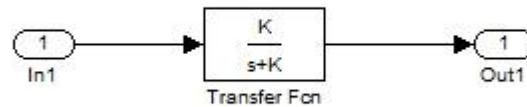
### Laboratory Exercise No. 3 Time Response – First Order System

**Objective:**

- To evaluate the effect of pole location upon response of a first-order system.
- To be able to design a first-order system that would meet the specification requirement.

**Instruction:**

1. Using the Simulink set up Figure 1 and plot the step response by using Simulink LTI Viewer  
 (Tools >> Control Design >> Linear Analysis)



2. Fill-up Table 1.

**TABLE 1**

<b>K (Pole Location)</b>	<b>Calculated Rise-Time (sec)</b>	<b>Calculated Settling-Time (sec)</b>	<b>MATLAB Rise-Time (sec)</b>	<b>MATLAB Settling-Time (sec)</b>
<b>1</b>	2.200	4.000	2.200	3.910
<b>2</b>	1.100	2.000	1.100	1.960
<b>3</b>	0.733	1.333	0.732	1.300
<b>4</b>	0.550	1.000	0.549	0.978
<b>5</b>	0.440	0.800	0.439	0.782
<b>6</b>	0.367	0.667	0.366	0.652
<b>7</b>	0.314	0.571	0.314	0.559
<b>8</b>	0.275	0.500	0.275	0.489
<b>9</b>	0.244	0.444	0.244	0.435
<b>10</b>	0.220	0.400	0.220	0.391

3. Design a First-Order System with a given specification. Complete the Table 2

**TABLE 2**

<b>K (Pole Location)</b>	<b>Rise – Time (sec)</b>	<b>Settling-Time (sec)</b>
27.500	<b>.08</b>	0.145
74.074	0.030	<b>.054</b>
220.000	<b>.01</b>	0.018
133.333	0.017	<b>.03</b>

**CONCLUSION:** What is the effect of pole location in first-order system to the rise-time and settling time of the system?

Pole location is inversely proportional to the rise-time and settling time of the system. As pole location increases, rise-time and settling time decreases.