

# ECE 461/661 Handout #19

## Routh Tables

Fill in a Routh table for the following polynomial

Determine the range of  $k$  for stability

$$(s - 1)(s + 4)(s + 5)(s + 6)(s + 7) + 2k = 0$$

$$s^4 + 14s^3 + 59s^2 + 46s + 2k - 120 = 0$$


## Solution

Fill in a Routh table for the following polynomial

Determine the range of k for stability

$$s^4 + 14s^3 + 59s^2 + 46s + 2k - 120 = 0$$

<b>1</b>	<b>59</b>	<b>2k - 120</b>	
<b>14</b>	<b>46</b>	<b>0</b>	
<b>55.71</b>	<b>2k - 120</b>	<b>0</b>	
<b>76.154 - 0.503k</b>	<b>0</b>	<b>0</b>	<b>k &lt; 151.53</b>
<b>2k - 120</b>	<b>0</b>	<b>0</b>	<b>k &gt; 60</b>
<b>0</b>	<b>0</b>	<b>0</b>	

Net Result:

$$\mathbf{60 < k < 151.53}$$

Row #3

$$a) \frac{- \begin{vmatrix} 1 & 59 \\ 14 & 46 \end{vmatrix}}{14} = 55.714$$

$$b) \frac{- \begin{vmatrix} 1 & 2k-120 \\ 14 & 0 \end{vmatrix}}{14} = 2k - 120$$

Row #4

$$a) \frac{- \begin{vmatrix} 14 & 46 \\ 55.714 & 2k-120 \end{vmatrix}}{55.714} = 76.154 - 0.503k$$