

# Homework #7: ECE 461/661

Error Constants, Routh Criteria, Sketching a Root Locus. Due Monday, October 9th

## Error Constants

1) Determine the error constants and steady-state error for the following systems

G(s)	System Type	Kp	Kv	Error for a unit step input
$\left(\frac{100}{(s+2)(s+7)}\right)$				
$\left(\frac{100}{s(s+2)(s+7)}\right)$				
$\left(\frac{100(s+5)}{s^2(s+2)(s+7)}\right)$				
$\left(\frac{100}{(s-2)(s+7)}\right)$				

## Routh Criteria

Determine the range of k that results in a negative definite polynomial (i.e. a stable system)

- 2)  $(s - 1)(s + 10)(s + 12) + 2k = 0$
- 3)  $(s + 1)(s + 3)(s + 7)(s + 8) + 2k = 0$

## Sketching a Root Locus

Sketch the root locus plot for the following systems for  $0 < k < \infty$ . Also plot the

- real axis loci, break away points, jw crossings (if any), and asymptotes

- 4)  $(s - 1)(s + 10)(s + 12) + 2k = 0$
- 5)  $(s + 1)(s + 3)(s + 7)(s + 8) + 2k = 0$

## Root Locus with Complex Poles & Zeros

Sketch the root locus plot for the following systems for  $0 < k < \infty$ . Also plot the

- real axis loci, break away points, jw crossings (if any), asymptotes, and departure/approach angle

- 6)  $G(s) = \left(\frac{10}{s(s+8)(s+1+j4)(s+1-j4)}\right)$
- 7)  $G(s) = \left(\frac{(s+j2)(s-j2)}{s(s+1)(s+5)(s+6)}\right)$