**Problem 1** (10 Points) For the system shown, (a) find $K_p$, $K_v$, and $K_a$, (b) find the steady state error for the inputs $50u(t)$, $50tu(t)$, $50t^2u(t)$, and (c) find the system type.

![Block Diagram](image)

Figure 1: Block Diagram

**Problem 2** (10 Points) For a unity (negative) feedback system with forward transfer function

$$G(s) = \frac{K}{(s + a)(s + b)}$$

find the sensitivity of the steady state error to the changes in parameters $K$ and $a$ for a step input.

**Problem 3** (10 Points) Sketch the root locus for a unity (negative) feedback system with forward transfer function

$$G(s) = \frac{K(s + 3)(s + 5)}{(s + 1)(s - 7)}$$

Find the break-in and break away points as well.