Automatic Control Systems – June 27, 2023
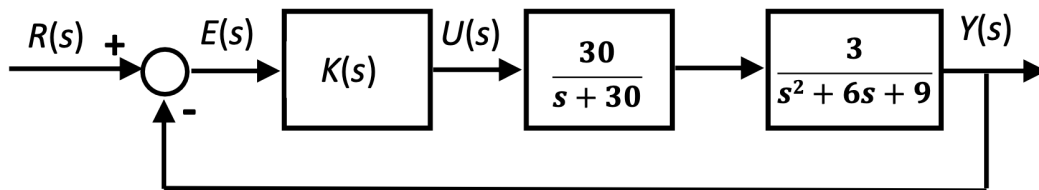
Student:_____ **ID:**_____

1. Given the LTI system defined by the transfer function $G(s)$,

$$G(s) = \frac{2-s}{s^2 + 7s + 12},$$

   a. calculate the analytic expression of the forced response to a step input of unitary amplitude (i.e., step response);

   b. draw the qualitative step response.

2. For the closed loop system shown in figure,

   a. devise $K(s)$ in order to satisfy the following requirements:

   i. $e_\infty \leq 0.1$ for a reference step signal $r(t) = 1(t)$;

   ii. overshoot $s \leq 15\%$;

   iii. settling time $t_{s5\%} \leq 0.6$ s.

   b. calculate the gain margin of the devised control system.

Time available: 2 hours