

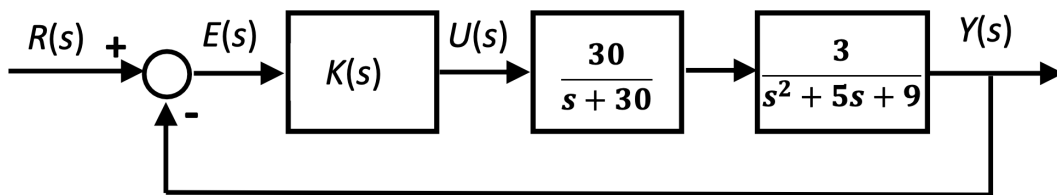
Automatic Control Systems – October 11, 2023

Student: _____ ID: _____

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

$$G(s) = \frac{10(s + 1)}{(s^2 + 7s + 12)},$$

- calculate the analytic expression of the forced response to a step input of unitary amplitude (i.e., step response);
 - draw the qualitative step response.
2. For the closed loop system shown in figure,



- devise $K(s)$ in order to satisfy the following requirements:
 - $e_{\infty r} \leq 10\%$ w.r.t. a reference step signal r ;
 - overshoot $s \leq 30\%$;
 - settling time $t_{s5\%} \leq 0.5$ s;
- calculate the gain stability margin of the devised control system.

Time available: 2 hours