STUDENT NUMBER.....

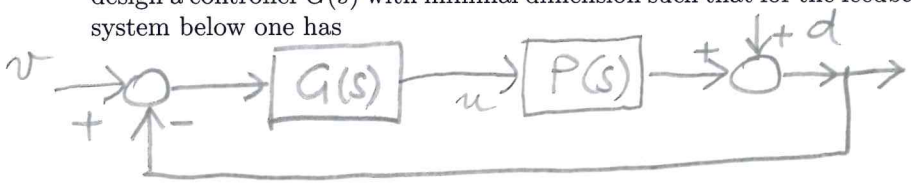
CONTROL SYSTEMS (B) - 2/2/2018

[time 2 hours; no textbooks; no programmable pocket calculator]

1) Given

$$P(s) = \frac{10}{s^2}$$

design a controller $G(s)$ with minimal dimension such that for the feedback system below one has



(i) asymptotic stability (use the Nyquist criterion)

(ii) the output steady state response to disturbances $d(t) = 1$ is 0

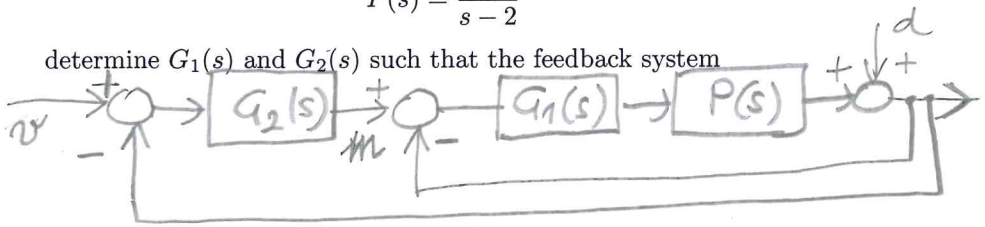
and for the open loop system one has

(iii) $m_\phi^* \geq 60°$ and $\omega_t^* = 0.1$ rad/sec.

2) Given

$$P(s) = \frac{1}{s-2}$$

determine $G_1(s)$ and $G_2(s)$ such that the feedback system

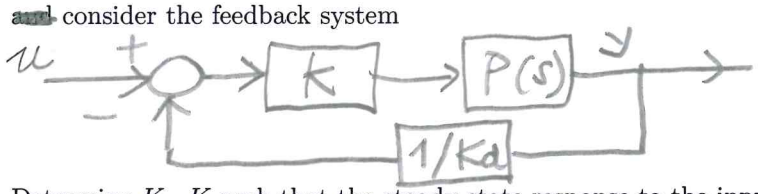


is asymptotically stable and the steady state output response to constant disturbances $d(t)$ is 0. Draw the root locus of $PG_1(s)$ (with the help of the Routh table).

3) Given

$$P(s) = \frac{1}{s-0.2}$$

consider the feedback system



Determine K_d, K such that the steady state response to the input $u(t) = 2\sin(2t)$ be $y_{ss}(t) = 2\sin(2t - \pi/4)$.