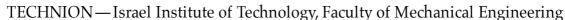
הטכניון – מכון טכנולוגי לישראל, הפקולטה להנדסת מכונות





Introduction to Control (034040) tutorial 9

Question 1. The process

$$P(s) = \frac{12}{(s+2)^2(s+2.5)}$$

is controlled in closed loop (unity feedback) by a proportional controller, $C(s) = k_p$. Find stabilizing k_p 's using the Nyquist stability criterion.

Question 2. The process

$$P(s) = \frac{s^2 + 4s/3 + 4}{6s(s^2 + s/2 + 1)}$$

is controlled in closed loop (unity feedback) by a proportional controller, $C(s) = k_p$, for $k_p > 0$. Find the number of closed-loop poles in the RHP as a function of k_p using the Nyquist stability criterion.

Question 3. Use the Nyquist stability criterion to determine the stability of the unity-feedback closed-loop system with

1.
$$L_1(s) = \frac{1}{s^2}$$

2.
$$L_2(s) = \frac{\sqrt{3}s + 1}{s^2(s + \sqrt{3})}$$

3.
$$L_3(s) = \frac{s + \sqrt{3}}{s^2(\sqrt{3}s + 1)}$$

Explain the difference.