# Final Exam
# Solution proposal final exam
# IA1117 Control theory with implementation (theory part)
# Tuesday December 12, 2017

November 6, 2018

## Task 1 (20%): System dynamics: From response to model

**a)** A pure time-delay $y = h_p(s)u$ with

$$h_p(s) = Ke^{-\tau s}, \tag{1}$$

with $K = 2$ and $\tau = 5$.

**b)** An integrating plus time-delay plant $y = h_p(s)u$ with

$$h_p(s) = k\frac{e^{-\tau s}}{s}, \tag{2}$$

with velocity gain approx $k = 2$ and $\tau = 5$.

**c)** A time constant system with inverse response $y = h_p(s)u$ with

$$h_p(s) = K\frac{1 + \tau_z s}{(1 + T_1 s)(1 + T_2 s)}e^{-\tau s}, \tag{3}$$

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**d)** A time delay oscillating system $y = h_p(s)u$ with

$$h_p(s) = K\frac{e^{-\tau s}}{\tau_0^2 s^2 + 2\xi\tau_0 s + 1}, \tag{4}$$

with relative damping $\xi = 0.2$.

## Task 2 (20%): System dynamics: From response to model