Correction to Final Exam - Spring 2012
TTK4135 Optimization and Control

Department of Engineering Cybernetics

In **Problem 3 Optimal Control and MPC**, part **a** and **b**, use the optimal control problem

$$
\begin{aligned}
\min \;\; f_0 = \frac{1}{2}\sum_{i=0}^{n-1} & \big\{(x_i - x_{\mathrm{ref},i})^\top Q_i (x_i - x_{\mathrm{ref},i}) \\
& + (u_i - u_{\mathrm{ref},i})^\top P_i (u_i - u_{\mathrm{ref},i})\big\} \\
& + \frac{1}{2}(x_n - x_{\mathrm{ref},n})^\top S (x_n - x_{\mathrm{ref},n})
\end{aligned} \tag{1a}
$$

subject to equality and inequality constraints

$$x_{i+1} = A_i x_i + B_i u_i,\ 0 \le i \le n-1 \tag{1b}$$
$$y_i = H x_i \tag{1c}$$
$$x_0 = \text{given (fixed)} \tag{1d}$$
$$U_L \le u_i \le U_U,\ 0 \le i \le n-1 \tag{1e}$$
$$Y_L \le y_i \le Y_U,\ 1 \le i \le n \tag{1f}$$

where system dimensions are given by

$$u_i \in \mathbb{R}^m \tag{1g}$$
$$x_i \in \mathbb{R}^l \tag{1h}$$
$$y_i \in \mathbb{R}^j \tag{1i}$$

with $H = I$. Theorem 2 is based on the above model. For the remainder of **Problem 3**, use the optimal control problem in the appendix, i.e., Equations (A.9a)–(A.9i).

Norsk på neste side.

Korreksjon til avsluttende eksamen - Våren 2012
TTK4135 Optimalisering og regulering
Institutt for Teknisk kybernetikk

I **Oppgave 3 Optimalregulering og MPC**, del **a** og **b**, bruk optimalreguleringsproblemet

$$
\begin{aligned}
\min \;\; f_0 = \frac{1}{2}\sum_{i=0}^{n-1} \Big\{ &(x_i - x_{\mathrm{ref},i})^\top Q_i (x_i - x_{\mathrm{ref},i}) \\
&+ (u_i - u_{\mathrm{ref},i})^\top P_i (u_i - u_{\mathrm{ref},i}) \Big\} \\
&+ \frac{1}{2}(x_n - x_{\mathrm{ref},n})^\top S (x_n - x_{\mathrm{ref},n})
\end{aligned} \tag{1a}
$$

med likhets- og ulikhetsbetinglesene

$$x_{i+1} = A_i x_i + B_i u_i, \;\; 0 \le i \le n-1 \tag{1b}$$
$$y_i = H x_i \tag{1c}$$
$$x_0 = \text{given (fixed)} \tag{1d}$$
$$U_L \le u_i \le U_U, \;\; 0 \le i \le n-1 \tag{1e}$$
$$Y_L \le y_i \le Y_U, \;\; 1 \le i \le n \tag{1f}$$

hvor systemdimensjonene er gitt av

$$u_i \in \mathbb{R}^m \tag{1g}$$
$$x_i \in \mathbb{R}^l \tag{1h}$$
$$y_i \in \mathbb{R}^j \tag{1i}$$

med $H = I$. Theorem 2 er basert på modellen over. I resten av **Oppgave 3**, bruk optimalreguleringsproblemet i Appendix, det vil si ligningene (A.9a)–(A.9i).

English on the previous page.