

# Control Systems - Academic Year 2012-2013 - First Test

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**Ex-1:** Consider the system:

$$\begin{cases} dx/dt = \begin{bmatrix} 1 & 2 \\ 0 & a-2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u \\ y = \begin{bmatrix} 1 & 0 \end{bmatrix} x \end{cases}$$

where  $a$  is a real parameter.

- i) Determine all values of the parameter  $a$  for which it is possible to stabilize the system through an output dynamic feedback.
- ii) Determine all values of the parameter  $a$  for which an output dynamic feedback controller exists so that the eigenvalues of the closed loop system coincide with  $-1$ .
- iii) Determine the controller solving ii).

**Ex-2:** The reachability property. Definitions and formal results.

**Available time: 80 minutes**

**Note:** At the end of the exam you can decide either to give us your test or not. If you give us your test, your mark obtained in a previous test, regarding this part of the Control System course, is directly replaced by the mark obtained in the current test.