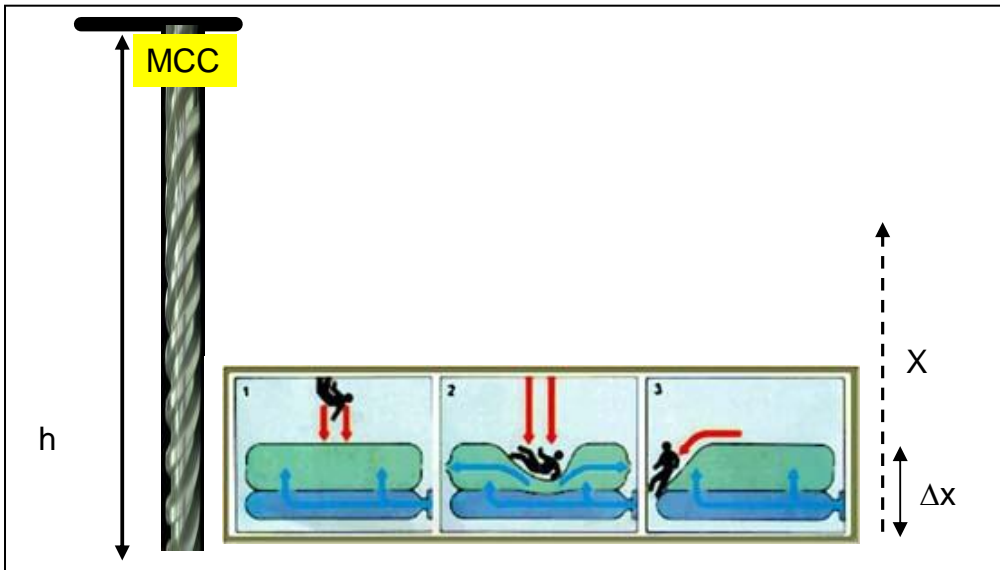


Candidate Name and Surname

Registration N°



A testing system of jump cloths for building evacuation consists on a motor that automatically adjusts the jump height based on the X value of the rebound possible from the cushion.

The cushion is made of a suitable synthetic

material with an elastic constant k and a typical deformation Δx equal to 0.5 X.



The goal is to be able to adjust the angular speed of the motor so as to measure different bounce heights at which to sequentially launch objects that emulate persons, so as to verify when the rebound can become dangerous.

1. Draw the block scheme of the acquisition/regulation chain identifying the input and output variables in every block and in particular the process variable.
2. Calculate the transfer function of the process highlighting what variables must be known.
3. Plot the Bode diagram of the loop function (process + actuator) discussing the eventual problems in terms of stability/instability.
4. What would change in the process transfer function to model the cushion as a hydraulic piston?
5. Describe a transducer useful to measure the process variable, its conditioning network and the interface with the microprocessor.
6. Illustrate the cascade control referring to the example of a heat exchanger into which we want to control the temperature of a liquid entering into it.