INDUSTRIAL ELECTRONICS – EXAM SEPTEMBER 08th 2016

Candidate Name and Surname …………………………………………………………………..

Registration N° …………………………………………………………………………………
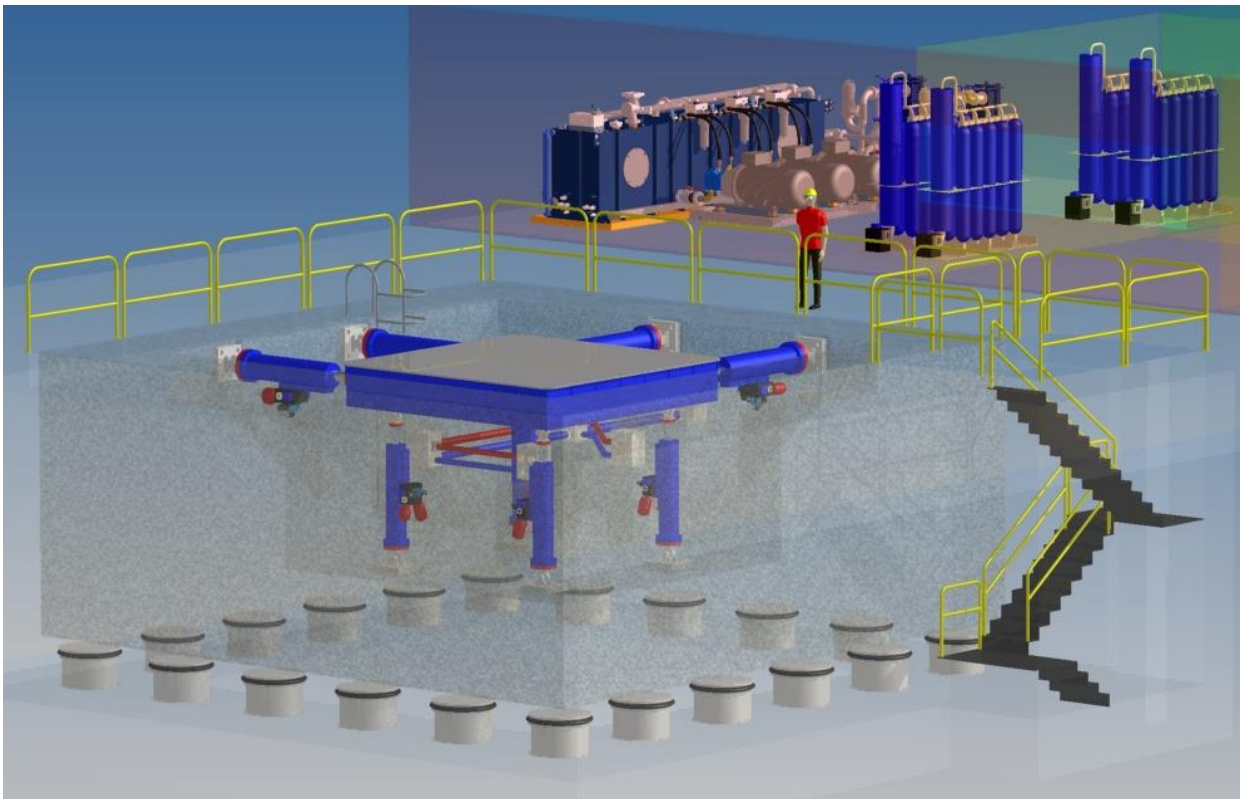
The systems for analyzing and preventing damages caused by earthquakes are based on the use of vibrating plates similar to that recently installed at the Eucentre of the University of Pavia.
These platforms are based on piston actuators moved by rotating motors on which a worm screw is mounted. As a result of the rotation, this screw creates the thrust which, depending on the position of the piston, can be horizontal or vertical, simulating a jolting or undulating movement.
A microprocessor detects the platform oscillations and regulates the power supply of the motor according to the type of earthquake to be simulated. The control keeps the system stable if necessary.

1. Draw the block scheme of the acquisition/regulation chain identifying the input and output variables in every block and in particular the process variables.
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. Show the numerical implementation of the regulator if it is necessary.
4. Design a circuit that allows to measure the process variable with a +/- 5% precision.
5. Briefly answer to the following questions:
− why the absolute encoder is not suitable to detect the movement direction?
− The magnetic flux chained to a coil is given by the inductive flux multiplied by the number of the coils irradiated by the flux itself. Does this mean that the chained flux is > than the inductive one?
− How to set the time for switching on a SCR/TRIAC device using a microprocessor?
− In the command circuit of a stepper motor what is the value of the drain and source voltages when $V_{thr} > V_{13}$?