

Full Name \_\_\_\_\_

**Question 1.** Explain the working principle of a load cell and how strain gauges may be used to support the measurement.

**Question 2.** Displacement sensors (e.g., potentiometers or ultrasound sensors) can be used as building blocks of more complex sensors. Provide 3 examples of such sensors, what they measure, and how displacement sensors may be used in those cases.

*Note:* the reported sensors may or may not have been presented during the course; you can provide suitable use-cases for displacement sensors.

**Question 3.** Design a finite state machine, which implements the controller of a washing machine.

Inputs are:

- the on/off button
- the water temperature sensor
- a water level sensor
- a timer

Outputs control the following actuators:

- a pump that can make the water flows in and out
- a drive that rotates the bowl
- a resistor that can warm the water

The FSM has to implement a single working cycle, composed by:

- a filling phase, during which the tank is filled with cold water (assume the soap is loaded automatically together with water in this phase)
- a heating phase, during which the water is heated
- a washing phase, during which the laundry is washed with hot water
- a rinse phase, during which the laundry is rinsed by clean cold water
- a spin-drying phase

Make adequate assumptions where needed.

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