Escola Superior de Tecnologia e Gestão Instituto Politécnico da Guarda	**Laboratorial Work**

Nº 1			
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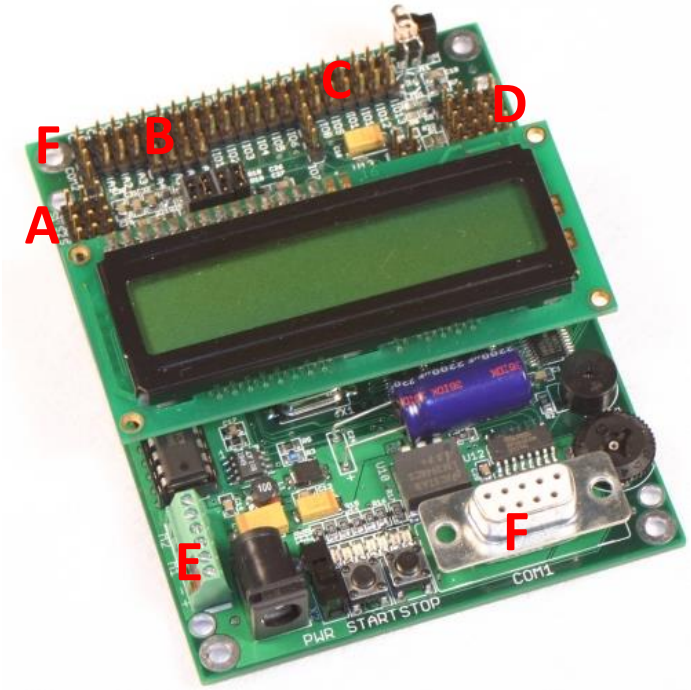
Fill in the header record with the names and numbers of the group members and add "(missing)" next to the name, in case any member of the group missed the class. After finishing the laboratorial work, submit it via the form at http://bit.ly/2ISOYfy.

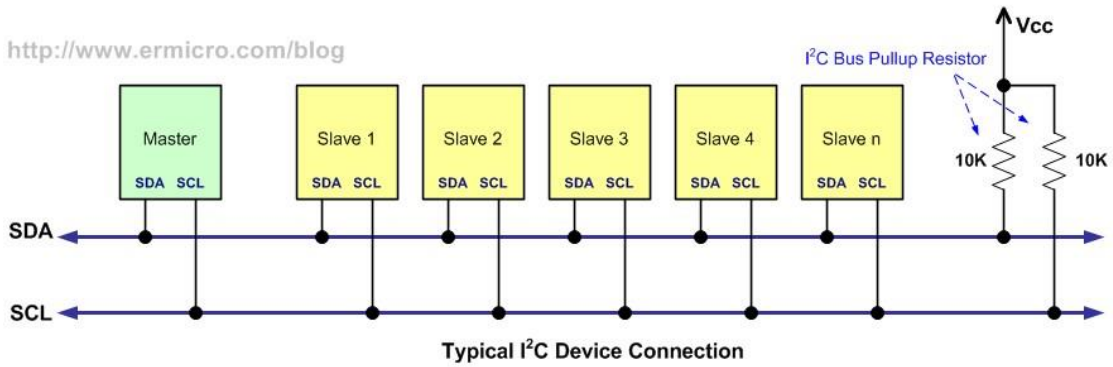
1. Complete the following table by inspecting your robot and filling in the missing information. Signal the location of each port type by copy-past more letters and positioning the correspondent letter on top of the image at the correct location.

Type of Port		Labels on the board	Quantity	Location
A	Servomotors			
B	Analogical	A1=A7	7	
C	Digital	IO1 = IO13	13	
D	I2C	I2C	1	
E	Motor CC	M1 a M2	2	
F	RS-232		2	

2. Write the name of the component of the IntelliBrain that has the functionality presented in the table.

Functionality	Name of the Component
Use an analog to digital converter to read a voltage between 0 and 5 volts and convert it to an integer value.	Analog Ports (A1=A7)
Interface directly to hobby servo motors.	Servo Ports (S1-S8)
Serves as the connection to the PC when we are programming the robot.	Serial Port(COM1)
Can be useful to directly display sensor readings.	LCD
It provides a means for you to manually control a variable setting, such as the speed of a motor.	Thumbwheel
Can be useful for debugging a program, by signaling visually if some code was executed or not.	LED´S
When configured as an input, returns a false value when the signal is low (nearest 0 volts) and true when the signal is high (nearest 5 volts).	Digital Port(IO1 a IO13)

3. The IntelliBrain has 5 I2C ports where we can connect devices (sensors or actuators) that have an I2C interface. But in fact it is only one port because the I2C is a bus. The IntelliBrain 2 is an I2C master and the sensors and actuators we attach are I2C slaves. Each I2C slave must have a unique device address which is used to communicate to the device. The figure illustrates the concept. Find out how many devices with I2C interface can be connected to the I2C bus of the IntelliBrain. (Tip: Find out how many bits are used to address the devices. Find that information in the User Guide of the controller).



Typical I²C Device Connection

R: 2^7= 128

4. What are the electrical voltage and current of the power source used by the robot? What is the maximum voltage supported by the controller? (Tip: Find the answer in the User Guide of the controller).

   R: 9V

5. What is the maximum current and maximum voltage supported by the DC motor ports of IntelliBrain controller? (Tip: Find the answer in the User Guide of the controller).

   R: Voltage: 9V, Current: 1amp.

6. Complete the following paragraph about the analog ports of the IntelliBrain controller.

   The IntelliBrian 2 has 7 analog ports that can also be configured as input/digital ports. When reading an analog port, we obtain a value between 0 and 1023 which is proportional to the voltage between 0V and 5V applied to the port signal pin. There is also a set of special analog ports with 4 pins prepared to connect QRB1134[1] , and are identified with the labels A4 to A7.

   [1] Look in the User Guide of the controller the name of the sensors that can be connected to these special analog ports with 4 pins.

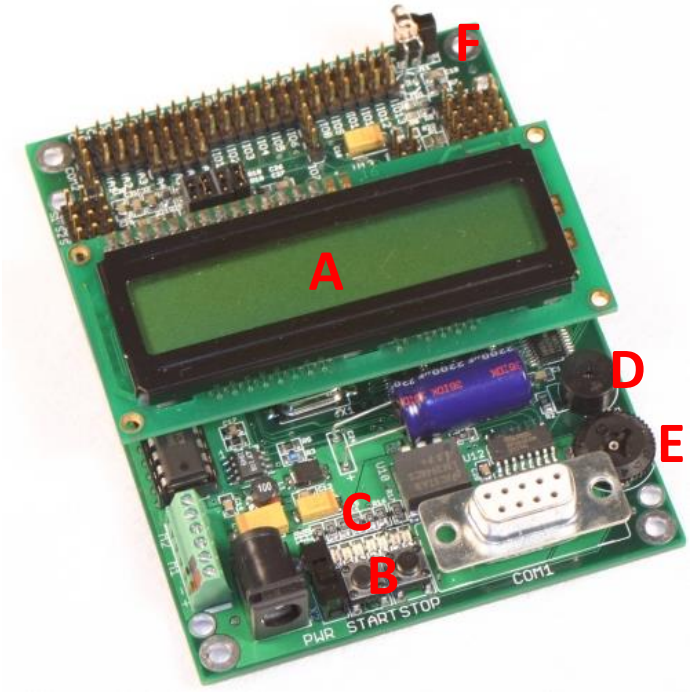
7. Complete the following paragraph about the digital ports of the IntelliBrain controller.

   The IntelliBrian 2 has 13 digital ports that can be configured as INPUT or OUTPUT. When reading a digital port, we obtain a value of 0 or 1 which are respectively relative to the voltage of 0V and 5V applied to the port signal pin.

8. Complete the following paragraph about the ports and pin arrangement (position).

   The ground pin for each port is always the pin nearest the edge of the board. The power pin is always the second pin from the edge of the board, next to the ground pin. The voltage of the power pin is 5V for all ports except the SERVO ports and the COM2 port that have a voltage of 6V. The next pin, third from the board edge, is always SIGNAL. On four-pin ports, the fourth pin is SECOND SIGNAL PIN.

9. Complete the following table by inspecting your robot and filling in the missing information. Signal the location of each interface element of the IntelliBrain controller by copy-past more letters and positioning the correspondent letter on top of the image at the correct location.

Type		Label on the board	Quantity	Location
A	LCD	NA	1	
B	Start and Stop Buttons	Start/Stop	2	
C	LEDs	NA	7	
D	Buzzer	Buz1	1	
E	Thumbwhell	RV1	1	
F	IR Receiver	NA	1	

10. Describe possible applications (different of those already mentioned in other questions) for the following elements of the interface:

Thumbwhell: Faz scroll nas linhas do array que se apresentam no ecrã.

Buzzer: Produz uma nota musical quando encontra a vela.

LEDs: Quando não deteta um objeto acende o led verde, quando deteta acende o led vermelho.