



## Quiz: Final test

TOTAL POINTS 21

1. What is a bipolar transistor used for?

1 point

- ☐ To accumulate charge between the collector and the base
- ☐ To control the voltage between the collector and the emitter of the circuit applied to the base
- ☒ To control the electric circuit between the collector and the emitter of the circuit applied to the base

2. Why can we connect LEDs directly to the controller's outputs with no need to use a transistor?

1 point

- ☐ The controller's pins are secured from overloads
- ☐ The controller's pins are optimized for the connection of the LEDs without resistors
- ☐ The controller's pins allow the connection of almost any load to them
- ☒ The controller's pins are optimized for the electric circuit drawn by the LEDs

3. What does the voltage between the resistors in the voltage divider depend on?

1 point

- ☐ From R1 rating

- ☐ From R2 rating and the voltage at the input
- ☐ From R1 rating and the voltage at the input
- ☐ From R2 rating
- ☐ From the voltage at the input
- ☒ From R1 and R2 rating and the voltage at the input

4. What is the difference in the voltage between the two measurements at the analog input if in one case, `analogRead()` returns the 860 value, whilst in the other case, it returns 861?

1 point

- ☐ 0.1V
- ☐ 0.5V
- ☐ 1V
- ☒ 0.005V
- ☐ 5V

5. What's typical of a signal?

1 point

- ☐ A signal always has the same nature as the event that it corresponds to
- ☒ After it appears, a signal doesn't depend on the event that it corresponds to

- ☒ A signal exists within a certain system
- ☐ A signal cannot be propagated
- ☒ A signal doesn't necessarily correspond to something

6. What's the difference between the recording and the reading of a digital signal, if any?

1 point

- ☐ When we read the LOW signal, the voltage is 0V, and with the HIGH signal, it's 3V. On the other hand, when we record the LOW signal, the voltage is 3V, and when we record the HIGH signal, the voltage is 5V
- ☒ When we read the LOW signal, the voltage is lower than 3V, and with the HIGH signal, it's higher than 3V. On the other hand, when we record the LOW signal, the voltage is 0V, and when we record the HIGH signal, the voltage is 5V
- ☐ There is no difference

7. Calculate the following expression:  $(a \ \&\& \ !b) \ || \ !(a \ \&\& \ b)$ , if "a" and "b" are true

1 point

- ☒ False
- ☐ True

8. What allows us to see that the brightness of the LEDs is different when they are connected to Arduino Uno?

1 point

- ☒ The usage of PWM
- ☒ The fact that a human eye neutralizes frequent blinking of an LED with changing duration by perceiving it as it were constantly changing its brightness
- ☐ Long-term voltage variation at Arduino's output
- ☐ The usage of a field transistor when connecting the LED

9. What will we see in the Port Monitor when the following code is executed?

1 point

```
#define NUMBER 100

int data[NUMBER];
int choice[] = {7, 6, 5, 4, 3, 2, 1, 0, 1, 2, 3};

void setup() {
    Serial.begin(9600);
    for(int k = 0; k < NUMBER; ++k)
        data[k] = k;
}

void loop() {
    int counter = 1;
    Serial.println(data[action(counter)]);
    counter *= 3;
```

```
while(true){}  
}  
  
int action(int option)  
{  
    return choice[option + 1];  
}
```

- ☐ 5 3 3
- ☐ Nothing
- ☐ 5 5 5 (until the Port Monitor is turned off)
- ☐ An error
- ☒ 5

10. What factors should you consider when choosing between infrared and ultraviolet distance meters?

1 point

- ☐ Free storage space in the controller
- ☐ Controller's power source
- ☒ Absorption and reflection by surrounding objects

☐ The presence of free pins that support external interrupts

☒ Measurement range

☒ Direction diagram

11. Tick the statements which are true concerning a step motor

1 point

☒ A step motor helps achieve the right positioning thanks to its step-based movement

☐ A step motor can only rotate in one direction

☐ You only need Arduino to control a step motor

☒ The driver controlling a step motor is necessary to create the correct sequence of control pulses

☐ The rotation range of a step motor is restricted to 180 degrees

12. Which stages are included into the process of creation of a 3D model on an FDM 3D printer?

1 point

☒ Creation of a 3D model of a part

☒ Turning a model into a G-code

- ☒ Transmission of the G-code to the printer
- ☐ Transmission of the html marking to the printer via the Internet
- ☐ Turning a model into html marking
- ☐ Treatment of the part with sodium chloride

13. What needs to be taken into consideration when you design power for your device?

1 point

- ☐ Presence of acoustic components in the circuit
- ☒ The electric current drawn by all the components
- ☐ Whether or not PWM is going to be used
- ☒ Supply voltage of all the components
- ☐ Number of free pins
- ☒ The common "ground" of the components that use different power sources

14. Why is it not a good idea to connect a collector motor directly to the controller's pins?

1 point

- ☐ Arduino's pins don't have a terminal block

- ☐ A special sequence of control pulses should be generated by a special module
- ☐ The controller cannot control the direction of rotation
- ☒ The motors draw more current than it is permissible at the controller's pins

15. What's the major difference between a servomotor and a collector DC motor?

1 point

- ☒ We need additional radio parts to connect a collector motor to the controller
- ☒ The servomotor allows us to hold the shaft rotation angle
- ☐ The servomotor doesn't contain a reducer
- ☐ We don't have the possibility to control the speed of a collector motor
- ☐ The collector motor has some in-built electronics that make sure that it follows certain operating principles

16. How can we ensure that there is no power slump at the controller when we turn the motors on?

1 point

- ☐ By transforming power in the motor driver
- ☐ By using a diode in the circuit
- ☐ By installing a protection circuit in the motor driver



- ☒ By organizing separate power for the motors and the controller

17. Let's imagine that pin 7 is pulled to the "ground". It is connected to the power supply unit through the tact switch. The collector motor is connected through L293D. There are the following macrodefinitions in the code: ENABLE, INPUT1, and INPUT2, which designate the numbers of the pins to which the corresponding inputs of the micro circuit are connected. What will happen to the motor if the main loop contains the following code:

1 point

```
analogWrite(ENABLE, 255);
```

```
digitalWrite(INPUT1, digitalRead(7));
```

```
digitalWrite(INPUT2, !digitalRead(7));?
```

- ☐ When the tact switch is on, the motor rotational speed will increase
- ☐ When the tact switch is on, the motor will stop
- ☐ When the tact switch is on, nothing will change in the way the motor operates
- ☒ When the tact switch is on, the motor will change the direction of its rotation
- ☐ When the tact switch is on, the motor rotational speed will decrease
- ☐ When the tact switch is on, the motor will turn on

18. How can we regulate the range of values received from the analog line sensor?

1 point

☒ By changing the height at which the sensor is installed

☐ By connecting to the output that supports PWM

☒ By using a trimming resistor

19. What was the error we mentioned in Week 5 when we talked about the realization of a proportional controller?

1 point

☐ Error in compiling the program that contains the proportional controller

☐ Error of sensor reading

☐ Different speeds at the left and the right wheels

☐ Error of transmitting a wrong parameter into the drive() function

☒ Deviation of current values received by the sensor from the desired value

20. When the robot moves, it tries to stay above the borderline, where the sensor shows the value of 325. The difference in the speed of the wheels is being regulated. The error coefficient (which we calculate by extracting the current value of the sensor from the desired one) is 0.3. The  $e^3$  coefficient is 0.00001.

1 point

How will the speed of the wheels change if the sensor gets the values of 312 and 456?

Repeat the calculation after excluding  $e^3$  from the regulator

Organize your answer in the following way: first write the change of the speeds with the sensor value of

312 and  $e^3$ ; then the change of the speeds with the sensor value of 456 and  $e^3$ ; the change of the speeds with the sensor value of 312 without  $e^3$ ; the change of the speeds with the sensor value of 456 without  $e^3$ ; round your answers off to the nearest integer (from 0.5 to 1) and separate them with a space.

Type your answer here

1

21. What should be taken into account when you work with external interrupts?

1 point

- ☒ The variables used in the functions that are called when external interrupts are used should be announced with the "volatile" key word
- ☒ The number of the interrupt doesn't coincide with the pin number
- ☐ The variables used with external interrupts should be announced with the "external" key word
- ☒ You shouldn't use delay() in the function that is called once the event happens
- ☐ Every Iskra/Leonardo pin supports the work with external interrupts
- ☒ Not every pin supports the work with external interrupts