Vocational Skills Competition
ELECTRONICS (PROTOTYPING)
11 - 13 March 2024

SEMI-FINAL TASK

The task consists of designing and making a sine-wave signal generator controlled via an Arduino embedded system. The task consists of three stages:

- designing and making the electronic system,
- programming of the built system,
- control measurements.

1. Designing the signal shaping electronic system

In order to perform this part of the task, you should find documentation of the Arduino Uno in the literature. On the basis of , you should design and make yourself a circuit which is functionally compatible with the Arduino Uno. To do so, you should:

- present the electronic project of the circuit under construction;
- design a PCB board;
- make the previously designed PCB by yourself;
- assemble and commission the circuit.

The documentation should include:

- enlarged photos of all soldering points,
- general view of both sides of the PCB (before and after soldering),
- photographs documenting the various stages of the completed work,
- listing of the written control program compatible with the Arduino Uno standard,
- photographs documenting the measurement process and oscillograms.

2. Program generating a sinusoidally alternating signal using PWM

After making the above circuit, running it and testing it, it is necessary, using any contact board or a self-made PCB, to design a signal shaping circuit that will convert the signal from any PWM output of the Arduino Uno circuit into a sinusoidal signal. The filling of the PWM signal should be controlled by a connected potentiometer, which should change the frequency of the sine wave signal.

To do this, you should:

- write a control program compatible with the Arduino Uno standard,
- test the programme in the circuit.

3. Making measurements.

Using an oscilloscope, take measurements of the amplitude and frequency of the waveforms made. You should find and show on oscillogram the minimum and maximum frequency of the generated waveform.

You should attach pictures of oscillograms of the PWM input signal and the sinusoidal output signal (on one oscillogram - using a two-channel oscilloscope) to your project.

4. Assessment

You will be assessed on the documentation you have produced - the semi-final assignment report. This task consists of three parts, which at the same time signal the area of knowledge and skills necessary for the final.

The report should include a list of the tools used, the materials required and a detailed description, supported by photographs taken during the work, of all the activities leading to the solution of the problem set in the task.

The documentation is to be produced in such a way that (based on it) the described task can be carried out again by people with no previous knowledge of the problem, but with a secondary technical education in the field of electronics technology.

All photos taken must be cropped so that only the essential elements are present. Photos should not exceed A5 format. It is assumed that one page of work can contain two photos with a brief description.

All necessary diagrams and technical drawings must be included at a resolution and size that allows them to be easily read when printed on A4 paper.

Documentation should be saved as a pdf file. Only one report can be submitted per participant.

5. Scoring

A maximum of 100 points can be obtained for completing the task.

- Design and development of an electronic system - 40 points,
- Programming of the built system - 30 points,
- control measurements - 30 points.

Please send the completed semi-final assignment with attachments to the following email address:skills@elektronik.edu.pl by 11 February 2024.

Please note: All documentation should not exceed 20 MB