

**SKEE/SEEE 3223: Microprocessor**  
**Assignment 2: [Group-15 marks]**  
**DUE: 18 JAN 2024**

By using the AVR Studio as well as Proteus / AVR Simulator IDE / Simulide you are required to design and write a program which will implement **car park system** (figure 1). The details of the car park system as following.

A two hundred car parking space system installs two sensors at the entrance and exit gates, namely ENTRY and EXIT, respectively. The system uses INT0 and INT1 for detecting the car entry and the car exit. Three 7-segment displays are needed to show the current available car park spaces and 2 LEDs (Green and Red) to indicate a car passes through entry and exit gate, respectively.

On start-up of the system, the 7-segment will display the group number for 2s then after that the car park system started to monitor the Entry and Exit sensors.

Whenever ENTRY goes low (a car enters the car park), the content of current car spaces available will decreases by one and at the same time a GREEN LED lights up for 500ms to indicate there is a car entering the car park. When EXIT goes low (car exit from the car park), the current car spaces available will increases by one and RED LED lights up for 500ms. However, when there is no parking space available, the 7-segment display will show "F", "U", "L", "L" characters having a 250ms delay time between characters.

But this simulation (AVR Simulator IDE) might have a flaws. Sometimes it working sometimes are not (especially for interrupt programming – very frustrating). I suggest you to use the Proteus Design Suite or SimulIDE or alternatively you may buy ATmega32 development board (to be purchased along with USB ISP + ATmega32A PU chip - see Figure 2) – Bonus marks will be given for those using the ATmega32 development board.

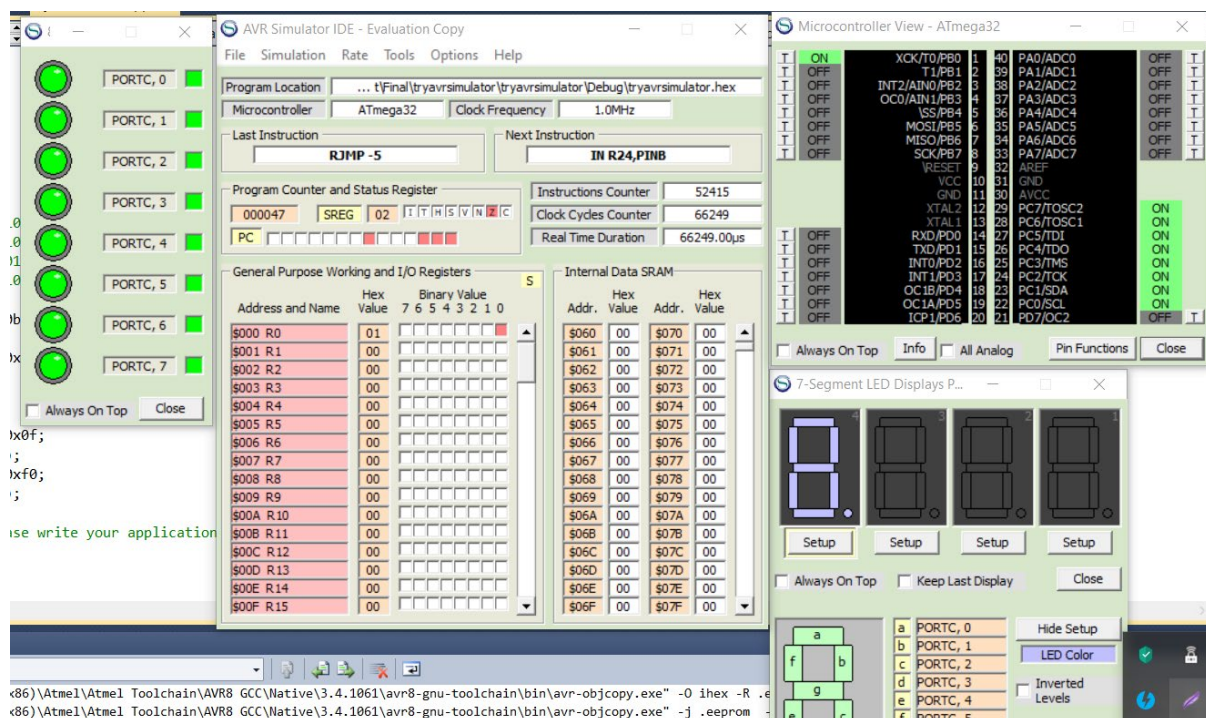


Figure 1: AVR Simulator IDE

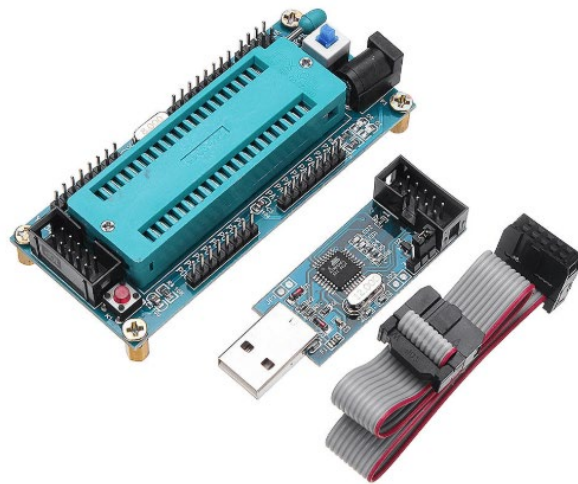


Figure 2: ATmega32 development board

In your report, you should include:

- a) The program specification (function of the program for each line of the instructions).
- b) The flow chart of the program.
- c) The circuit diagram of your design. Show the labels and connections between your Atmega32 with I/O peripherals CLEARLY. Use software to show the circuit design.
- d) State the configuration used for Leds, 7-segment displays and switches. If you using a simulator (show the configurations setting in your AVR Simulator IDE / Proteus).
- e) Discussion on how subroutine calls are executed in the program when a certain switch/button is selected.
- f) How you determine your time delay and show the calculations.

On top of that, you are required to do **a demo video** to demonstrate that your programming and switches simulation are working fine. The demo video should include:

- Introduction of each of the group members – each group members must introduce themselves.
- Demo your project. Make sure all of the matric cards and interrupts are working. Matric card will stop when an interrupt is triggered and resume once the interrupt has finished. Capture the video of the presenter, while he/she is presenting during the demo session.
- Upload your video to YouTube or any online video platform and share the link in the submission form – together with the report. Please make your video visible to the public.
- Use your creativity to make an attractive demo video.

\*Note: Your XTAL value is set at 1 MHZ.

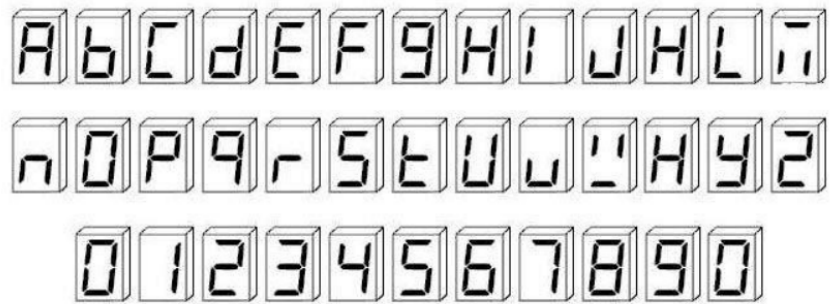


Figure 4: Possible alphabet character that can be displayed by a 7-segment Display.

**\*Note:** Proceed with downloading a FREE trial of AVR Simulator IDE: [click here](#) or SIMULIDE: [click here](#).

**\*\*Note:** OR if you have extra money you may proceed with purchasing of ATmega32 development board + USB ISP + ATmega32A PU chip. Other components (i.e. LEDs, 7-segments, Switches, Jumper, Resistors, etc) can be obtained from FKE Store, P08 (Ground Floor).