

FACULTY OF ELECTRICAL ENGINEERING, UTM
SEE3223 MICROPROCESSOR
SEMESTER 2 SESSION 2011/2012 SPACE KL

Name: 1. _____
 2. _____
 3. _____

Answer all questions on maximum 5 pieces of A4 papers. You have to present for 7 minutes (3 minutes Q & A) on 19th May 2011 including the usage of AVR Studio in simulating your answer. Marks are given based on answers to the questions, clarity of your presentation and ability in using AVR Studio. Dateline: 19th May 2011.

You are assigned to design and develop a simple educational system. The system uses Atmega32 microcontroller. The system has four pull-up switches connected to PORTD.0-3 and four active-high LEDs connected PORTA.0-3. Two 7-segment (Figure 1) are connected to the same PORTB where PORTB.7 is connected to a, PORTB.6 is connected to b, PORTB.5 is connected to c, PORTB.4 is connected to d, PORTB.3 is connected to e, PORTB.2 is connected to f, PORTB.1 is connected to g and PORTB.0 is connected to ‘.’.

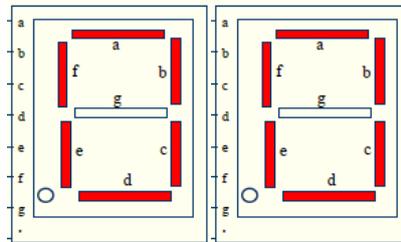
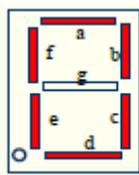
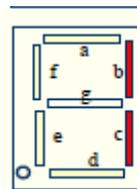


Figure 1: 7-segments

1. Draw your circuit including the microcontroller connecting to all the basic required components such as power supply, oscillator, reset, switches, LEDs and the two 7-segments. You have to include your proposed solution circuit for running the two 7-segments by using the same PORTB. **[5 marks]**
2. Explain briefly what a 7-segment is and its operation. Provide what value should be given to PORTB in order to light up number 0-9. Example values given to PORTB for lighting up ‘0’ and ‘1’ are given as follow. **[5 marks]**



PORTB = 0b1111 1100



PORTB = 0b0110 0000

3. Explain how you control two 7-segments in your proposed system based on the circuit you draw in Q1. **[10 marks]**
4. Write a full assembly program* that all inputs will be displayed on the LEDs. Please include flow chart of this program. **[10 marks]**
5. Write a full assembly program* to use two external-interrupt-requests at Int0 and Int1 to choose two different behaviours on the 7-segments. Int0 will display the two 7-segments to count up from 00 to 20, then reset back to zero and count up again. The process continues until another Interrupt is requested. Int1 will display the count down from 20 to 00 and then stop. The delay between displays is about 1 second. Please include flow chart of this program. **[20 marks]**

**Please comment your program.*