ABU DHABI POLYTECHNIC

EMET

EMEE-207
Embedded Systems

Final Examination

Semester 1 2016/2017

2 hours

Instructor Muhammad Umair Muzaffar

Students answer on the question paper
Calculators, drawing kits and dictionaries are allowed
No additional materials are required

STUDENT NAME	
STUDENT NUMBER	A
CRN	1 3 1 4
DEPARTMENT	EMET

READ THESE INSTRUCTIONS CAREFULLY

Write your *name*, *number*, and department **clearly** in the boxes above.
Answer **all** questions.

You may use a pencil for all your work.

Answers that are not **clearly readable**, if any, will not be marked.

Question	Score
1	/15
2	/25
3	/10
4	/10
5	/20
Total	**/80**

All mobile devices are not allowed during examination.

Abu Dhabi Polytechnic considers cheating or attempting to cheat a serious offense that will result in disciplinary action taken against involved individuals.

Question 1 (15 points) (CLO:3,5):

1. A Boolean variable can be
   a. High
   b. Low
   c. Both
   d. None of the above

2. The ADC in the Arduino Uno Microcontroller is
   a. 8 bits
   b. 10 bits
   c. 12 bits
   d. 16 bits

3. For 100% duty cycle, the following decimal must be sent to the analogWrite()
   a. 0
   b. 127
   c. 255
   d. 1023

4. The maximum output of the DAC is equivalent to
   a. 4 bits
   b. 8 bits
   c. 10 bits
   d. 16 bits

5. ++ performs the following operation
   a. Decrement
   b. Addition
   c. Subtraction
   d. Increment

6. The size of a float is
   a. 8 bits
   b. 16 bits
   c. 32 bits
   d. 64 bits

7. During operation, when the timer register reaches its maximum value, it
   a. Stops
   b. Overflows
   c. Keeps incrementing
   d. Starts to decrement

8. An 8 bit time can count from 0 to:
    a. 127
    b. 255
    c. 1023
    d. 2047

9. The following is a scheme to represent negative numbers in binary
    a. 2's complement
    b. 1's complement
    c. Both
    d. None of the above

10. Bit number 3 of an 8-bit register (PORTB) needs to be set. Which of the following is a correct statement
    a. `PORTB = 3;`
    b. `PORTB = 1 << 3;`
    c. `PORTB = 0b01`
    d. `PORTB= 0x03`

11. $(125)_{10}$ can be written as _____ in hexadecimal and _____ in binary

12. $(11000011)_2$ can be written as _____ in decimal and _____ in hexadecimal.

13. A four digit binary number will have a maximum binary value of _____.

Question 2 (25 points) (CLO:3,4):

The code for the following question must use the AVR microcontroller directly to switch the LED.

The Green LED is connected to pin number 5 of Port C.

The Red LED is connected to pin number 4 of Port B.

A gas container contains pressurized gas. The pressure of the gas needs to not exceed 200 Pa. (Pa is the unit of pressure – Pascals)

A pressure sensor with the following characteristics is installed in the gas container:

- At 0 Pa, the sensor voltage is 0.1 V.
- The sensor coefficient is 50 Pa/V.

Write a code to read the pressure of the container using the pressure sensor.

The Green LED should be switched on if the pressure reading is less than 200 Pa.

The Red LED should be switched on if the pressure reading exceeds 200 Pa.

An LCD screen is connected to the entire setup which displays the pressure reading every 5 seconds.

Question 3 (10 points) (CLO:2,4):

In the Arduino Uno microcontroller, there are 2 interrupt pins as shown in the table below:

Board	int.0	int.1
Uno	2	3

Write a code that uses a PWM signal with 50% duty cycle to power an LED connected to the microcontroller.

The system should change the duty cycle to 100% when the int.1 is enabled.

Question 4 (10 points) (CLO:2,4):

Using the following ASCII table, write a code that converts the ASCII character to integer. The user must be asked to enter the number and the converted number should be displayed on the screen.

Decimal	ASCII
48	0
49	1
50	2
51	3
52	4
53	5
54	6
55	7
56	8
57	9

Question 5 (20 points) (CLO:2):

An AVR microcontroller has a crystal frequency of 4000 Hz.

Write a code to toggle an LED connected to pin 2 of Port B every 1 second using an 8 bit timer.

Clearly show any calculations before you write the final code.