CPE 325: Embedded Systems Laboratory
Laboratory Assignment #8

Assignment [100 pts]

Q.1 Write and test a program in C that functions as defined below **[80 pts]**

void UART_SETUP( );	Configures UCI to work in the UART mode at the baud rate of 115,200.
void UART_sendChar(char bip);	Sends a character via UART
char UART_getChar();	Waits for a character from UART and returns it.
void UART_sendString(char* str);	Sends a string via UART using sendCharacter(char c)
void UART_getLine(char* buf, int limit);	Receives characters via UART using UART_getCharacter()until it finds the new line character or until the limit of characters is exceeded. Writes that string (excluding the new line character) to the buffer allocated outside of the function. Terminates the string with the null character.

Test your functions to make sure they work properly and **none of them writes or reads non-allocated memory**. Make sure that UART_getLine inserts the null character at the end of the output string, and does not exceed the limit, including the null character.

You will write **MarketBot**, an interactive chat bot program, that helps the user to buy items in a Market. The program should work as follows:

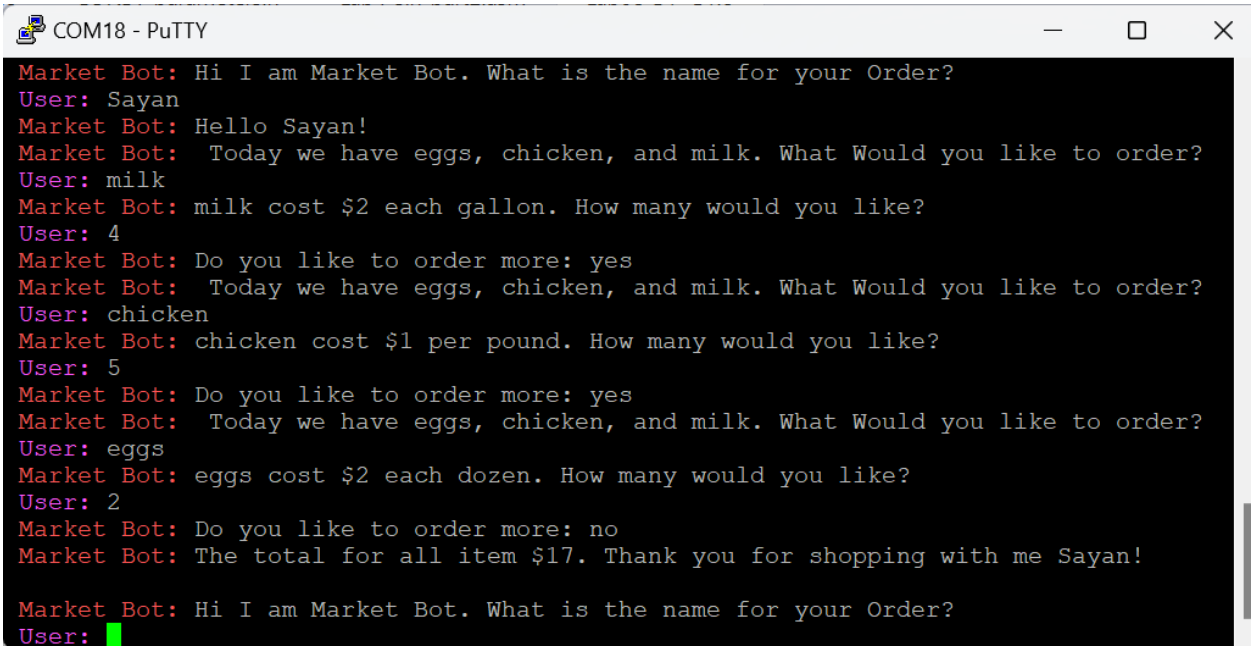
Initially display the following message in HyperTerminal (You may use Putty, MobaXterm, etc).

a. CalcBot greets the user with the following initial message: "**Hi I am Market Bot. What is the name for your Order?"**
b. When the user says the name and hits Enter, the chat bot responds as follows: "**Hello <user_name>, Today we have eggs, chicken, and milk. What Would you like to order?**". It should respond with the initial phrase to any message (including the empty one) other than that.
c. If the user responds with an invalid item name, the chat bot replies: "**<item> are not available today. Today we have eggs, chicken, and milk. What Would you like to order?**" The cycle of entering the operation should repeat until the user enters a correct item name.

d. Once operation is accepted, the bot asks for the quantity of items. Then it asks **"Do you like to order more:"** and if the user says **"yes"** it goes back to step 2 and asks "**Today we have eggs, chicken, and milk. What Would you like to order?**" until the user says **"no"**

e. With a "no", it shows the total with **"The total for all item $<total>. Thank you for shopping with me <username>"**, and goes back to step 1 to greet a new user.

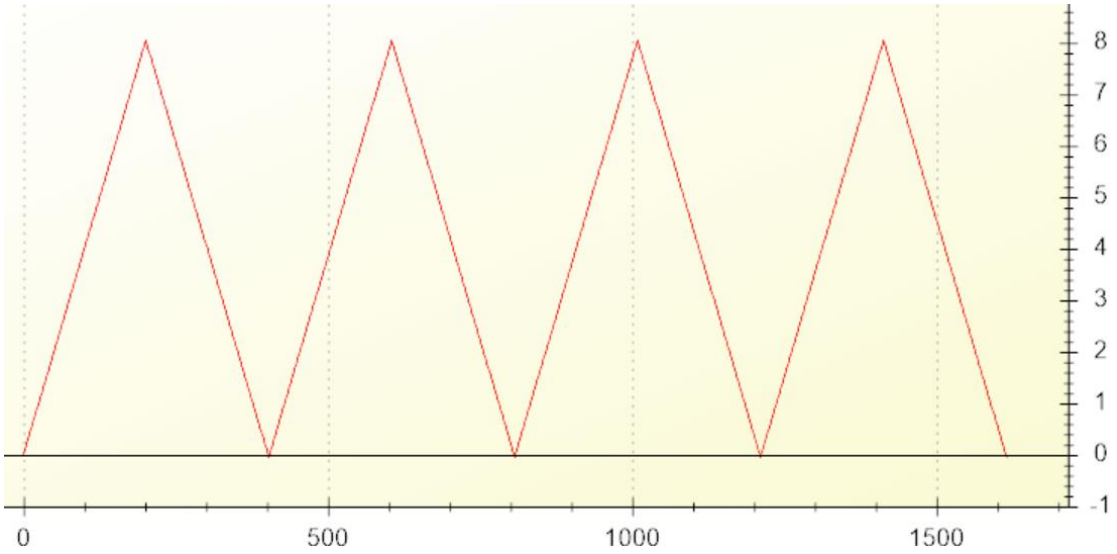
The following screenshot demonstrates the functionality of the MarketBot program:



Hints

- You can use snprintf function to concatenate strings and convert numbers to strings. Make sure you **do not overflow any buffers** when you use it.
- Use strcmp function to compare strings.
- Use atoi function to convert a string to a number.
- Echo characters back if you want to see what you type.
- Use the \r\n sequence to properly start a new line.
- The escape sequence for the backspace character is \b.

Q.2 Write a C Program that generates a triangular wave and displays it on the UAH Serial app (using a 57,600 baud connection). The parameters for the triangular wave are as follows: (a) Amplitude 8 Units. (b) Frequency: 2.5 Hz. This signal will be transmitted to the serial app for a duration of 4 signal periods. Example output is shown below.



Bonus [up to 15 pts]

1. For Part 1, an extra 5 points will be awarded if each message is labelled with the name of its author in color. A different color is required for each author for full credit.
2. For Part 1, an extra 10 points will be awarded if some functions are modified so that the user can erase the message they are typing by pressing the backspace key. Single backspace press should erase just one character. The deletion should never go beyond the current message. The buffer's content should be modified accordingly. Erasing characters from the screen without updating the buffer or vice versa can give you 5 pts maximum for this part.

Questions to be Addressed.

Please make sure that you have addressed following questions in your demonstration:

In a single demonstration, show the full operation of Q1.

Explain how the output was generated for Q2 for the specified duration.

Topics for Theory

1. Serial Communication and UART
2. UAH Serial App

Deliverables

1. Lab report which includes:
    a. Flowchart for Q1.
    b. Answers to any questions from the tutorial.
    c. Screenshots for both Q1 and Q2
    d. Any calculations required for timing, including the duration of the signal and its frequency in Q2.