**FORMAN CHRISTIAN COLLEGE (A CHARTERED UNIVERSITY)**



**Embedded Systems – CSCS 306**

**Fall 22’**

**Lab Number 1**

**Title of Lab/Assignment**

**Muhammad Sameed Gilani – 231488347**

**Adeel Akmal - 231465420**

**You should attach the lab / assignment handout as second page of this report.**

**From third page onwards following headings should be included:**

* **Introduction**
  + **Should carry information of all major library functions.**
* **Your logic / algorithm in simple English. Bullet points are appreciated.**
* **Your code**
* **Screen shots of at least three outputs of your code with appropriate inputs.**
* **References**

**INTRODUCTION:**

* **Serial.parseInt():**

This Function takes the input from the user and stores it as a long int.

* **Serial.available():**

This Function stores the bytes of available data that the user has entered in the serial window.

* **Serial.read():**

This function reads data from the serial buffer one byte at a time.

* **Serial.println():**

Used to display some output on the serial monitor with an additional “\n” at the end.

**LOGIC:**

* **Enter a 5-digit binary number:**

First, we use the Serial.available function to wait for any input by the user. Once the user enters the input on the serial monitor we used the Serial.parseInt function to read the input by the user in the form of a long integer and store it in a variable afterwards, we read data from the serial buffer using Serial.read until the buffer is empty. Now to store each digit of the input into an array we take the mod (%) of the input by 10 to get the remainder i.e. the last digit of the input number, this digit is stored in the array and a pointer is incremented. We further divide the input number by 10 to get the remaining most significant digits from the input (other than the remainder). This procedure is repeated in a loop until we the binary input is reduced to 0.

* **Find the Decimal value for the binary input:**

To convert the binary value to decimal we iterate through the array holding the binary number in reversed order and get the value at the given index and multiply it with 2^ (index of the number). This is then added to a global variable. We repeat this process for the entire array to get the decimal number.

* **Complement of the binary number:**

To get the complement of the number we simply iterate through the array and replace all the 0’s with 1’s and vice versa.

* **Enter a bit position to read:**

To get the input index from the user first we use Serial.available to wait for any input from the user once the user enters any input we use the Serial.parseInt function to get the input from the user and clear out the buffer using Serial.read.

* **Get bit at given position:**

We just return the bit from the array holding the binary number at the given position by the user using array indexing. Since the number is already stored in reversed order we will get the valid output.

**CODE:**

void display(int arr[]);

void populateArray(int arr[]);

float getDecimalValue(int arr[]);

void getComplement(int arr[]);

int getBitPos();

int readBit(int);

float dec;

int siz = 5;

int arr[] = {0,0,0,0,0};

int complArr[5];

void setup() {

// put your setup code here, to run once:

Serial.begin(9600);

Serial.println("\t====== LAB 01 ======");

Serial.println();

populateArray(arr);

display(arr);

float out = getDecimalValue(arr);

Serial.print("Decimal value of this binary number is: ");

Serial.println(out);

Serial.print("Complement of given binary number is: ");

getComplement(arr);

display(complArr);

Serial.println("Enter a bit position(Starting from the LS bit): ");

int pos = getBitPos();

if (pos >= 5)

{

Serial.println("Invalid bit position !");

}

else

{

Serial.print(pos);

Serial.print(" is: ");

int val = readBit(pos);

Serial.println(val);

}

}

void loop() {

// put your main code here, to run repeatedly:

}

int readBit(int p){

return arr[p]; //returns bit from given index

}

int getBitPos(){

while (Serial.available()==0){} // to wait for incoming data

int inputIndex;

inputIndex = Serial.parseInt(); //Converts the serial data to long int

while (Serial.available()>0){

Serial.read(); //to clear oout the serial buffer

}

Serial.println(inputIndex);

return inputIndex;

}

void getComplement(int arr[5]){

int i = 4;

while (i >= 0){

if (arr[i] == 1){

complArr[i] = 0; //Replace all 1's with 0's

}

else{

complArr[i] = 1; //Replace all 0's with 1's

}

i--;

}

}

float getDecimalValue(int arr[5]){

int i = 0;

while (i<5){

dec += arr[i] \* pow(2, i); //This converts the binary digit to it's decimal equivalent

i++;

}

return dec;

}

void populateArray(int arr[5]){

int inputBin;

Serial.println("Enter 5 bit bianry number: "); //Prompt User for input

while (Serial.available()==0){} // wait for user input

inputBin = Serial.parseInt(); //Read user input and hold it in a variable

while (Serial.available()>0){

Serial.read(); //to clear oout the serial buffer

}

int i = 0;

int digit;

while(inputBin) {

digit = inputBin % 10; //To get the remainder i.e: last digit

inputBin /= 10; //To get the number without the final digit

arr[i] = digit;

i++;

}

}

void display(int arr[5]){

int i = 4;

while(i >= 0){

Serial.print(arr[i]);

i--;

}

Serial.println();

}

**OUTPUTS:**





