**Bahria University, Lahore Campus**

Department of Computer Science

**Assignment 01**

**(Spring 2023)**

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| Course: | **Data Structure & Algorithms** | Date: \_3-14-2023\_\_ |
| Course Code: | CSC-221 | Max Marks: **10** |
| Faculty’s Name: | Ms. Zupash Awais | **Deadline: 16th March 2023(11: 00 PM)** |

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Instructions:

1. Understanding each question is a part of the assignment.
2. Solve the assignment with full honesty. Leave the question that is not clear to you or you are not able to solve, we will discuss it in the class for better understanding.
3. Try to think of a solution of your own. If you will keep on searching for solutions on Google, it will not make your problem-solving ability strong. This assignment is to sharpen your mind a bit or make you able to solve/think of a solution for any problem.
4. Copied assignments (from each other) will be awarded ZERO.
5. Trying ChatGPT is totally prohibited. It won’t be available for you in Exam so don’t put your future in DANGER.
6. *The assignment is to be submitted in the soft form on LMS till the deadline mentioned above. Bring hardcopy (printed) of your solved assignment on Friday(17th March 2023)*
7. No need to take a colored print or bring the assignment in files. Submit it as a normal black and white stapled paper

***\*\*Provide the solution in the box for each question\*\****

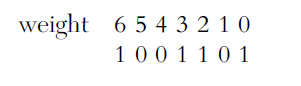
**Question 1 Marks: 05**

The language of a computer, called machine language, is a sequence of 0s and 1s. When you press the key A on the keyboard, 01000001 is stored in the computer. Also, the collating sequence of A in the ASCII character set is 65. In fact, the binary representation of A is 01000001 and the decimal representation of A is 65.

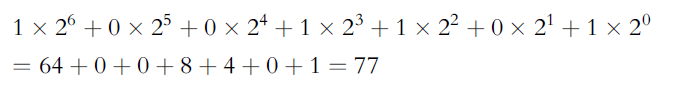
The numbering system we use is called the decimal system, or base 10 system. The numbering system that the computer uses is called the binary system, or base 2 system. The purpose of this exercise is to write a function to convert a number from base 2 to base 10.

To convert a number from base 2 to base 10, we first find the weight of each bit in the binary number. The weight of each bit in the binary number is assigned from right to left. The weight of the rightmost bit is 0. The weight of the bit immediately to the left of the rightmost bit is 1, the weight of the bit immediately to the left of it is 2, and so on. Consider the binary number

1001101. The weight of each bit is as follows:



We use the weight of each bit to find the equivalent decimal number. For each bit, we multiply the bit by 2 to the power of its weight, and then we add all of the numbers. For the binary number 1001101, the equivalent decimal number is



To write a program that converts a binary number into the equivalent decimal number, we note two things:

(1)The weight of each bit in the binary number must be known, and (2) the weight is assigned from right to left. Because we do not know in advance how many bits are in the binary number, we must process the bits from right to left. After processing a bit, we can add 1 to its weight, giving the weight of the bit immediately to its left. Also, each bit must be extracted from the binary number and multiplied by 2 to the power of its weight. To extract a bit, you can use the mod operator. Write a program that uses a stack to convert a binary number into an equivalent decimal number and test your function for the following values: 11000101, 10101010, 11111111, 10000000, and 1111100000.

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| **Code** |
| **#include<iostream>**  **#include<cmath>**  **using namespace std;**  **int k=0,b,s,p;**  **int convert(int n) {**  **int dec = 0, i = 0, rem;**  **while (n!=0) {**  **rem = n % 10;**  **n /= 10;**  **dec += rem \* pow(2, i);**  **++i;**  **}**  **return dec;**  **}**  **int main ()**  **{**  **int size=10;**  **int a[10];**    **cout << "Enter your binary :"<< endl;**  **cin>>b;**  **cout<< "the decimal is :"<<convert(b)<< endl;**    **return 0;**  **}** |
| **Output:** |
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**Question 2 Marks: 05**

Add a function in Stack code (given in slides) that can reverse the contents (string) of a stack, using only a second stack as auxiliary storage. The data must be popped in ascending order as a final output:

**For Example:**

**Input:** ZUPASH

**Output:** AHPSUZ

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| **Code** |
| **#include<iostream>**  **#include<stack>**  **using namespace std;**  **int st[100],size=100,top=-1;**  **void push(int val)**  **{**  **if(top>=size-1)**  **{**  **cout << "overflow "<< endl;**  **}**  **else**  **{**  **top++;**  **st[top]=val;**  **}**  **}**  **void pop()**  **{**  **if(top<=-1)**  **{**  **cout << "stack is underflow "<< endl;**  **}**  **else**  **{**  **cout << "your pop element is :"<< st[top]<< endl;**  **top--;**  **}**  **}**  **void display()**  **{**  **if (top>-1)**  **{**  **cout << "your stack elements are :";**  **for (int i=top;i>=0;i--)**  **{**  **cout << st[i]<<" ";**  **}**  **}**  **else**  **{**  **cout << "your stack is empty :"<< endl;**  **}**  **}**  **void printSorted(string s, int l)**  **{**    **// Primary stack**  **stack<char> Stack;**    **// Secondary stack**  **stack<char> tempstack;**    **Stack.push(s[0]);**  **for(int i = 1; i < l; i++)**  **{**  **int a = s[i];**      **int b = Stack.top();**  **if ((a - b) >= 1 or (a == b))**  **Stack.push(s[i]);**    **else if ((b - a) >= 1)**  **{**    **while ((b - a) >= 1)**  **{**  **tempstack.push(Stack.top());**  **Stack.pop();**    **if (Stack.size() > 0)**  **b = Stack.top();**  **else**  **break;**  **}**    **Stack.push(s[i]);**  **while (tempstack.size() > 0)**  **{**  **Stack.push(tempstack.top());**  **tempstack.pop();**  **}**  **}**  **}**  **string answer;**  **while (Stack.size() > 0)**  **{**  **answer = Stack.top() + answer;**  **Stack.pop();**  **}**  **cout << answer << endl;**  **}**  **int main ()**  **{**    **int ch, val,size;**  **string s;**  **cout<<"1) Push in stack"<<endl;**  **cout<<"2) Pop from stack"<<endl;**  **cout<<"3) Display stack"<<endl;**  **cout<<"4) printSorted "<< endl;**  **cout<<"5) Exit"<<endl;**  **do {**  **cout<<"Enter choice: "<<endl;**  **cin>>ch;**  **switch(ch) {**    **case 1: {**  **cout<<"Enter value to be pushed:"<<endl;**  **cin>>val;**  **push(val);**  **break;**  **}**  **case 2: {**  **pop();**  **break;**  **}**  **case 3: {**  **display();**  **cout << endl;**  **break;**  **}**  **case 4: {**  **cout<<"enter your string "<< endl;**  **cin>> s;**  **cout << "enter the size of string "<< endl;**  **cin>> size;**  **printSorted(s,size);**  **break;**    **}**  **case 5:**  **{**  **cout<<"Exit"<<endl;**  **break;**  **}**  **default: {**  **cout<<"Invalid Choice"<<endl;**  **}**  **}**  **}while(ch!=5);**  **return 0;**  **}** |
| **Output:** |
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