Lahore University of Management Sciences

BS Programme

Name:		**Roll Number:**	
Course Title:	Computational Problem Solving	**Semester**:	Spring
Course Code:	CS 100	**Academic Year**:	2017-2018
Instructor:	Zaid Saeed Khan	**Date**:	15th May, 2018
Exam:	Final	**Time Allowed**:	2.5 hours
Total Pages:	8	**Total Marks:**	**100**

DO NOT OPEN THIS EXAM UNTIL TOLD TO DO SO.

The instructions below must be followed strictly. Failure to do so can result in serious grade loss.

⇒ *Do not talk to anyone once the exam begins.*
⇒ *Keep your eyes on your own paper.*
⇒ *Read all questions very carefully before answering them. All questions are compulsory.*
⇒ *Only answers written within the given area will be marked.*
⇒ *You may use the area outside the answer boxes for rough work. The last page is also empty.*
⇒ *Put your pens down immediately when you are asked to. Marks may be deducted if you keep writing.*
⇒ *There are multiple versions of the exam. Do not try to copy from others. Cheating cases will be severely dealt with.*
⇒ *This booklet contains Q1-Q5. Q6-Q7 are programming questions available on a separate sheet.*
⇒ *It is recommended to spend about 1.5 hours on the written part and 1 hour on the programming part.*

Specific instructions:

1. Open book/notes, closed book/notes, help sheet: Closed Book / Closed Notes.
2. Calculator usage: Not allowed.
3. Write in pen/pencil: Anything except red pen.
4. Any other instruction(s): Mobile phones are not allowed.

VERSION 1

Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Max Marks	10	10	10	10	25	15	20	100
Marks Obtained								

Question 1 **[10 marks]**

a. Circle "**True**" or "**False**" for each of the following statements. **[3]**

- A structure can contain pointers to other structures but cannot contain another "actual" structure.

True / False

- Literals can be passed to functions by value but not by reference.

True / False

- The following literal has a null terminator: "Hello World".

True / False

b. Suppose you have a C string named cstr. Write a line of code to copy its contents to a C++ string named cppstr? **[1]**

c. Briefly describe 3 different ways the asterisk (*) can be used in C++ and give an example of each. **[6]**

Question 2 **[10 marks]**

Trace what is printed when the function below is called with each of the arguments in the table. Also explain briefly what the function does, and specifically what the last if condition is for.

```
void does_something(int n)
{
    while (n % 2 == 0)
    {
        cout << 2 << " ";
        n = n / 2;
    }

    for (int i = 3; i <= n; i = i + 2)
    {
        while (n % i == 0)
        {
            cout << i << " ";
            n = n / i;
        }
    }

    if (n > 2)
    {
        cout << n;
    }
}
```

value of n	Output
15	
11	
18	
What does the function do?	
What is the `if (n > 2)` for?	

Question 3 **[10 marks]**

Write a function called `mirror_add` that takes two 2D arrays as parameters and adds the "mirrored" version of the second one to the first one, for example:

```
 first            second                    first
[1,2,3]    +     [4,3,1] ----------->    [2,5,7]
[2,0,1]          [2,1,3]                  [5,1,3]
```

You only need to write the `mirror_add` function, not the `main` function. Assume that the column size of both arrays is 3.

Question 4 **[10 marks]**

Write a piece of code that does the following:

- Ask the user how many numbers he/she will enter
- Make a dynamic array to store the numbers
- Populate the array with the user's input (stop taking input if the user enters a non-numeric input or if the array is full)
- If there is some "empty" space in the array at the end (i.e. if the user did not enter enough numbers to fill the array), then:
    - Copy the values into a new dynamic array that is exactly the right size (so that no memory wasted). Do this using pointer notation (i.e. using array-pointer duality, no square brackets).
    - Deallocate the memory used for the old array

```
int main(){
```

Question 5 **[25 marks]**

a) The following program gets the user to choose between two options: (1) finding the volume of a cylinder or (2) finding the volume of a sphere. Once the user selects an option, the program asks for the relevant parameters (radius and height for the cylinder, or only radius for the sphere), and prints the required volume. **[15]**

The program has 6 errors. For each error, identify it, determine whether it is a syntax or logical error, and suggest how to fix it. One is done for you as an example.

```
1     #include<iostream>
2     using namespace std;
3
4     int V1; double V2,V3,V4;
5
6     double fun1(double v1,double v2){
7     const double v3=3.1415926535897932;
8     double v4=v3*v1*v1*v2;
9     return v3;
10    }
11    double fun2(double& v1)
12    {const double v2=22/7;
13    double v3=4*v2*v1*v1*v1/3;
14    return v3;}
15
16    int Main()
17    {
18    cin>>V1;
19    switch(V1){
20    case 1:
21    { cin>>V2; cin>>V3;
22    cout<<fun1(V2,V3); }
23    case2:{
24    cin>>v2;
25    cout<<fun2(&V2);
26    }
27    }return 0;}
```

Line (order not important)	Error Location	Type	Correction
16	Main	syntax	main (small m)

b) Apart from the errors it has, the program above is also written with many bad programming practices. There are several improvements that can be made which will make the code easier to run and/or understand and/or maintain, or are just better programming practices in general. One such improvement is given below. Identify 5 more improvements that can be made, giving an example of each. **[10]**

1.
Proper indentation should be used, i.e. one extra level for each opened bracket, e.g.
`int main()`
`{`
`    //code`
`}`

2.
3.
4.
5.
6.