This question paper contains 3 printed pages.

Roll No._____

Sr. No. of Question Paper	:	
Unique Paper Code	:	**32341101**
Name/Title of the paper	:	**Programming Fundamentals using C++**
Name of the Course	:	**B. Sc. (H) Computer Science**
Semester	:	**I (DSC-1) (Admissions 2019)**
Duration of Examination	:	**3 Hours**
Maximum Marks	:	**75**

Instructions for Candidates

1. Attempt any FOUR out of SIX questions.

2. All questions carry equal marks

3. All parts of a question must be answered together.

4. State the assumptions taken, if any, in your answers.

5. **The data types of variables/data members/arrays and return types of the functions/member functions should be assumed suitably unless explicitly mentioned.**

Q1. Write a program to calculate students' grade by performing the following tasks:

- Take input marks of five subjects from the user and store them in an array named **marks**.

- Define a function **calculate()** that accepts the array **marks**, finds three highest marks (best three subjects), calculates and returns the average percentage of marks of those best three subjects (Assume maximum marks of each subject to be 100.)

- Write a function **grade()** that accepts the percentage calculated in the above function as input, calculates and returns the grade of the student on the basis of the following conditions:

  - If the percentage is 80% or more, the grade is 'A'.

  - If the percentage is 60% or more but less than 80%, the grade is 'B'.

  - If the percentage is 40% or more but less than 60%, the grade is 'C'.

  - If the percentage is less than 40%, the grade is 'D'.

Q2. Write a program to do the following tasks:

- Five positive integers are accepted through command line arguments.

- Each integer is passed to a function **isPalindrome()** that checks whether the integer is a palindrome or not and returns true or false accordingly.

- If the number is a palindrome it is stored in a text file named **"Palindrome.txt"** and printed on console also.

Q3. Write the purpose and mention the arguments for each of the following built-in functions:

ceiling(), floor(), setprecision(), showpoint(), round()

Write a program that invokes the above functions with the following three numbers as input values.

123.456789, 123.499999, 123.500001

Also write the output of the above program, assuming that output values are to be shown with three places of decimal.

Q4. Define a class **Array** with one dimensional array of integers and its size as data members.

- Define a parametrized constructor and a copy constructor to initialize its data members. The parametrized constructor function should accept an array and its size as input parameters.

- Define a member function to perform operator overloading on the **(+)** operator to add two objects of the class **Array** and return a new object of the class **Array** that contains the sum of corresponding elements of one dimensional array of two objects of class **Array**.

- Define a member function **void display()** to display the object of class **Array**.

Q5. Write a program in C++ that does the following:

- Defines a structure called **ThreeDPoint** that represents a point in a 3D space. The point has an **x** coordinate, a **y** coordinate and a **z** coordinate.

- Defines a function **getPointData()** to accept values of **x**, **y** and **z** coordinates of a point from the user.

- Defines another function for operator overloading of *less than* **(<)** operator. The function compares **x** coordinates of two structure variables and returns true if that of first one is less than that of second. If both are equal, it compares **y** coordinates of two structure variables and returns true if that of first one is less than that of second. If they are also equal, it compares **z** coordinates of two structure variables and returns true if that of first one is less than that of second.

  For example if input values for two points, say **p1** and **p2** are **(1, 1, 2)** and **(1, 1, 0)** then **p1 < p2** returns **false** and **p2 < p1** returns **true**.

- Define two variables of the structure **ThreeDPoint**, namely- **p1** and **p2** in the **main()** function and print the smaller of the two points.

Q6. Write C++ functions to perform the tasks indicated against their names:

- **countUp()**: The function accepts a string and returns the count of uppercase letters in the given string.

- **toggleCase()**: The function accepts a reference to a string and toggles the case of each letter in the given string.

- **midString()**: The function accepts a string and if the input string has odd number of letters, the middle letter is returned as a string. If the input string has even number of letters, the two middle letters are concatenated and returned as a string.

- **printTermN()**: The function accepts value of a positive integer **n** as input and returns the nth term of the following series:

$$1 + \left(2 \times \frac{1^2}{2!}\right) + \left(3 \times \frac{1^3}{3!}\right) + \left(4 \times \frac{1^4}{4!}\right) + \cdots + \left(n \times \frac{1^n}{n!}\right)$$