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 onwards)**
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. If required, you may make suitable assumptions and state them clearly.

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 in C++ that provides a user-defined class **NewFloat** with a data member **floatData** of type **float**. The class also comprises the following members:

- default and parameterized constructors
- an inline member function **printData()** that prints the details of an object of the class
- a member function **deciData()** that returns the decimal part of **floatData**
- operator overloading to perform the following operations:
  - post increment (**++**) increments **floatData** by 1.
  - less than (**<**) on a pair of objects of the class. The function returns 1 if the data member of the object on the LHS of the operator is less than the data member of the object on the RHS of the operator and 0 otherwise.
  - int cast to convert the float data member of an object into an integer

Q2. Write a program in C++ that defines an m x n two dimensional array containing integer elements, where m and n represent the numbers of rows and columns respectively. The numbers of rows and columns should be defined as constants. The program should provide the following user-defined functions with appropriate parameters:

- **setArrData(...)**: The function accepts elements from the keyboard and stores them into the array.
- **printArrData(...)**: The function prints the array values on the screen.
- **getAverage(...)**: The function accepts the array, number of rows and number of columns as parameters and returns the average of all values in the array.
- **findMax(...)**: The function accepts the array, number of rows and number of columns as parameters and prints the greatest element from each column of the array.

Q3. Write a program in C++ that reads some text entered through the keyboard till the end of file (eof) character is entered. The words in the text are written to different text files as per the following conditions:

- The words beginning with any of the lowercase vowels (a, e, i, o, u) are written to a file **fileV.txt**.
- The words beginning with a digit (0 – 9) are written to a file **fileD.txt**.
- All other words are written to a file **fileRest.txt**.

Sample input:
```
Buy 1 kg apples And 17 oranges immediately
^Z
```

Sample output:
```
fileV.txt: apples oranges immediately
fileD.txt: 1 17
fileRest.txt: Buy kg And
```

Q4. Write C++ statements for the following tasks:

a. Write the prototype of a function **funP** that accepts two arguments- a constant one dimensional array of integers and a float; and returns a pointer to a double.

b. Accept three strings through command line arguments. If the number of integers entered is less than or greater than three, the program exits after displaying the message **"Wrong number of inputs!"**.

c. Interchange values of two integer variables using pointers.

d. An anonymous object of a derived class **Derv** is to be pointed to by a reference of its base class **Base**.

e. Write the prototype of a friend function **funObjs(...)** having references to two objects of a class **MyClassOne** as parameters and an object of a class **MyClassTwo** as return type.

Q5. Define an abstract class **Human** comprising sthe following members- **name** and **age** (with appropriate data types), a parameterized constructor and a pure virtual function **printDetails()**.

The program also defines two concrete classes- **Adult** and **Child** inheriting publicly from the class **Human**.

Class **Adult** has a data member- **voterID** (with appropriate data type).

Class **Child** has a data member- **schoolName** (with appropriate data type).

Define parameterized constructors for both the classes **Adult** and **Child**. The constructors should also have following validation check for the age input.

- The age of an adult should be more than or equal to 18 years.

- The age of a child should be in the range 0 to 18 (excluding both numbers).

Override **printDetails()** function for both the derived classes.

Define **main()** function to declare one object each for classes **Adult** and **Child** respectively and print the details of the objects.

Q6. Write a C++ program that prompts a user for three integers- the first denoting a month (1 to 12), the second denoting a day (1 to 31) and the third denoting a year. The output is displayed as **"month day, year"** string where month represents the name of the month.

For example, if inputs are **12**, **15** and **2020** respectively, the output is **December 15, 2020**.

A parameterized function **convertDate(...)** is defined to accept above three integers as arguments and return the appropriate string.

If the user enters any number other than a valid month number (integers from 1 to 12) as a first input, then the program throws an error (exception) of the type string. Write an exception handler that handles the exception by displaying a message **"Not a valid month"** and exits.

If the user enters any number other than a valid day number (integers from 1 to either 28, 30, or 31, depending on the month) as second input, then the program throws an error (exception) of the type integer. Write an exception handler that handles the exception by displaying a message **"Not a valid day"** and exits.

If the user enters month value 2, day value 29 and a non-leap year as third input, then the program throws an error (exception) of the type double. Write an exception handler that handles the exception by displaying a message "**Not a leap year"** and exits.