This question paper contains 4 printed pages

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Unique Paper Code : 32341101

Name/Title of the paper : Programming Fundamentals using C++

Name of the Course : B. Sc. (H) Computer Science

Semester : I

Year of Admission : 2019 onwards

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Attempt any FOUR out of SIX questions.

2. All questions carry equal marks.

Q1 Write a program in C++ that defines a class named **`List`**. The data members of this class are as follows:

- An integer array **`Arr`** of size 20.
- Index **`s1`** of type integer.

Define member functions in **`List`** as given below:

- parameterless and parametric constructor that initializes the elements of the array **`Arr`** and index **`s1`** to zero.

- **`void input()`**: This function asks the user for the number of elements that will be stored in the array **`Arr`**. The value entered by the user is stored in **`s1`**. Next it asks the user for **`s1`** values and stores the values entered by the user in the array **`Arr`**.

- **`void insert(int x)`**: This function will insert the value **`x`** at the end of the Array **`Arr`** if **`Arr`** is not full, else the function will print the message **`"List is Full"`**.

- **`void countduplicate():`** This function will count and display the number of duplicate elements in the array **`Arr`**.

- **`void search(int x) :`** This function will search for an element **`x`** in the array **`Arr`**. If the element is found then the function will display its position else it will print the message **`"Element not found"`**.

- **`void display ():`** This function will display the elements stored in the array **`Arr`**.

Q2 Write a program in C++ that defines a 2D array **`A`** of characters. The array has a size **`m*n`** where **`m`** is the number of rows and **`n`** is the number of columns. **`m`** and **`n`** should be declared as constants. Define the functions with the following prototypes in the program.

- **`void read(char A[][n], int m1):`** This function will read an array of **`m1`** strings and stores them in the array **`A`** .

- **`void countvowels(char A[][n],int m1):`** This function will display the count of vowels in the array **`A`** .

- **`int find(char A[][n],int m1, char b[n]):`** This function will search a string **`b`** in the array **`A`** . It will return 1 if the string **`b`** is found in the array **`A`** else it returns 0.

- **`void display(char A[][n],int m1 ):`** This function will display the array of strings **`A`**.

Q3 Write a program in C++ that reads text from the keyboard till the end of character is entered. The text is stored in the file named **`"File1.txt".`**

For each of the specified prototypes given below, write the function definition.

- **`void read(ofstream& fp ):`** This function reads the text entered through the keyboard and stores the text in the file named **`"File1.txt".`**

- **`void copy(ifstream& fp, ofstream& fp1):`** This function reads the content of the file **`"File1.txt"`** and copies this content without newline to the file named**`"File2.txt"`**.

- **`void print(ifstream& fp):`** This function displays the content of a given file using **`fp`**.

- **`void countlength(ifstream& fp):`** This function will read the content of a file and display the number of characters in the file.

- **`void contentcheck(ifstream& fp1,ifstream& fp2):`** This function reads two files **`"File1.txt"`** and **`"File3.txt"`** and compares the content of these files

character by character. The function should print the message **"Both Files have the same content"** if the content of both the files matches exactly. If the content does not match then it should display the message **"Content of the files is not same"**. Use Exception handling to deal with any errors that arise during file operations in the **contentcheck** function.

Q4 Write a program in C++ that defines a class named **Point** that represents a three-dimensional point **(x, y, z)**. This class declares variables **x, y** and **z** of the integer data type. The member functions of this class should be defined as given below.

- parametric and copy constructor for initializing the data members **x,y** and **z** of the class **Point**.
- Define a function using operator overloading to change the sign of the data members **x,y** and **z**.
- Overload Operator **<<** as a friend function in the class for displaying the object of this class.
- Write a function for converting the object of the class **Point** to its integer equivalent.
- Overload the subscript operator **[]** for the class **Point** such that object **o1** of this class return **x** for **o1**[1], **y** for **o1**[2] and **z** for **o1**[3].

Q5 Define a class **Employee** with data members – **Name, Organization, Qualification** and **Salary**. In this class define member functions as given below:

- parameterless constructor to initialize the data members - **Name**, **Organization**, **Qualification** and **Salary**.
- A function **disp()** for displaying the **Name**, **Organization**, **Qualification** and **Salary**.
- A pure virtual function void **print()**.

Derive the class **Faculty** from the **Employee** class using public inheritance. In the **Faculty** class declare data members: **Course** and **Workload**(number of working hours of a faculty in a week) of the appropriate data type and define a parametric constructor for initializing these data members. Override the **print()** function in **Faculty class** to display the **Course** and **Workload.**

Derive a class **Staff** from the **Employee** class using public inheritance. This derived class declares data members -**Designation** and **Job_Description** of the appropriate data type. Define the parametric constructor of this class to initialize the values of **Designation** and

Job_Description. Override the **print** function in this class to display **Designation** and **Job_Description.**

Define the **main()** function and declare one object each of **Faculty** class and **Staff** class. Use run time polymorphism and display the details of **Faculty** and **Staff** class objects.

Q6 Write the C++ statements for the following tasks:

- Write a prototype for the function named **fread()** that accepts two parameters: pointer to a constant character and a float variable. The return type of this function is void.
- Use ternary operator to find the maximum of three numbers **x,y** and **z** and store the maximum value in the variable **u.**
- Write a statement that extracts a substring of length 4 from the beginning of the string **s1**= "Programming".
- Write a statement to initialize a float array **arr1** with any four real literals at the time of declaration.
- Define a class **X** that declares a static data member **n** of type integer. Write the statement for initializing the value of static data member **n** as zero.