Roll No.

S. No. of Question Paper : **2534**

Unique Paper Code : **2342571101**

Name of the Paper : **Programming Fundamentals Using C++**

Name of the Course : **B.A. (Prog.)/B.Sc.(P)/B.Sc. Maths. Sc.**

Semester : **I**

Duration : **3 Hours**   Maximum Marks : 9

(Write your Roll No. on the top immediately on receipt of this question paper.)

Section A is compulsory.

Attempt any **4** (*four*) questions from **Section B**.

All parts of a question must be answered together.

Section A

1. (*a*) What are identifiers in C++ ? Identify which of the following identifiers are valid an which are invalid ?

   (*i*)   Po178_ddm

   (*ii*) _78hhvt4

   (*iii*) 902gt1

   (*iv*) Tyy;ui8

   (*v*)   For

   (*vi*) Fg026 neo

(b) Explain the following :

   (i) Built-In data Types

   (ii) User defined data types

   (iii) Derived data types

(c) Explain pointers in C++ with an example. How does a pointer differ from a regular variable ?

(d) Write the output of the following C++ code :

```
#include <iostream>
using namespace std;
int main( ) {
int num1 = 10;
double num2 = num1;
cout << "num1: "<< num1 << endl;
cout << "num2: "<< num2 << endl;
return 0;
}
```

(e) Write a C++ program to find largest of 2 numbers.

(f) Find the output of the following C++ code :

```
#include <iostream>
using namespace std;
int main() {
int a = 15, b = 4;
```

```
int result1 = a / b * b + a % b;

bool result2 = (a == 15) && (b < 10);

int result3 = a++ + --b;

int result4 = 10 + 2 * 3 / 4 - 5;

cout << "Result 1: " << result1 << endl;

cout << "Result 2: " << result2 << endl;

cout << "Result 3: " << result3 << endl;

cout << "Result 4: " << result4 << endl;

return 0;

}
```

(g) Which of the following statements is true or false :   3

   (i) A constructor is automatically invoked on object creation, cannot have a return type-not even void, and does not return any value.

   (ii) A destructor is a member function that is specifically called on an object by a programmer when the object goes out of scope.

   (iii) The constructor can be overloaded. That is, you can have more than one constructor in a class having different parameter lists.

(h) Write a C++ program to ensure that a user enters a positive integer. Initially, the program should ask the user for a number. If the user enters a number less than or equal to zero, the program should keep asking until a valid positive number is provided.   3

(i) Differentiate between single and multiple inheritance.   3

(j) Identify the error in the following Try-Catch block and correct the same :

```cpp
int main( ) {
    int a = 10, b = 0;
    try {
        if (b == 0) {
            throw "Division by zero error!";
        } else {
            cout << "Result: " << a / b << endl;
        }
    } catch (int e) {
        cout << "Error: Division by zero!" << endl;
    }
    return 0;
}
```

Section B.

2. *(a)* Write a C++ program that takes a positive integer *n* and produces *n* lines of output as shown : (*n* = 4 as output) :

```
1
1 2
1 2 3
1 2 3 4
```

5

(b) Explain the following jump statements with the help of an example :

(i) break

(ii) continue

(iii) return

(c) What do you mean by header files in C++ ? How do header files reduce the compilation time and efforts of the programmer ? How do you include a header file in a C++ program ?

5

(a) Write a C++ program that uses a for loop to compute the sum of the first n natural numbers. Prompt the user to input a value for n; print out the sum.

5

(b) Write a C++ program to take an integer as an input, reverse the digits of that integer and print that reversed integer.

5

(c) Write a C++ program that prints the Fibonacci sequence up to the nth term. The program should ask the user to enter the value of n, then print the first n Fibonacci numbers.

5

(a) Which of the following statements is true or false :

5

(i) In C++, a pointer may be assigned the address of a variable of any type without any problem.

(ii) The * stands for address of the pointer variable.

(iii) You can increment a pointer to point at the next memory location of the type that it is pointing at.

(iv) A pointer can be dereferenced before it is declared, and the program will still run with no issues.

(v) In C++, delete is used to free up memory which was allocated using malloc( ).

(b) Write a C++ program simulating a simple **Shape** hierarchy. Declare a base class called **Shape** with a **virtual function area( )**. Derive two classes, **Circle** and **Rectangle**, each overriding the area( ) function to calculate the area of a circle and a rectangle respectively. Program to ask for all inputs necessary-for example, the radius for the circle and the length and width for the rectangle. Then calculate the area and print the results.

(c) Enumerate any *five* characteristics of object-oriented programming.

5. (a) What will be the output of the following code when the value of num is :

(i) 1

(ii) 67

(iii) • 2

(iv) A and

(v) default

```cpp
#include <iostream>

using namespace std;

int main( ) {

    switch (num) {

        case 1:

            cout << "One" << endl;

        case 2:

            cout << "Two" << endl;

            break;
```

```
    case 3:

        cout << "Three" << endl;

        break;

    case 4:

        cout << "Four" << endl;

        break;

    default:

        cout << "Invalid" << endl;

    }

    return 0;

}
```

(b) What are default constructors in C++ ? Explain with an example.   5

(c) What is constructor overloading ? Explain with the help of an example.   5

6. (a) Write a C++ program for a library system that stores the details of books in an array. Each book has the following information :   5

- Title (a string)

- Author (a string)

- Year of publication (an integer)

You are given an array of pointers, each pointing to a dynamically allocated object of type **Book**. The user can add new books to the system, display the information of all the books, and delete a book when it is no longer needed.

(b) Write a C++ program that swaps the values of two integers using pointers. Create a function swapValues( ) that takes two integer pointers and swaps the values they point to. In main( ), declare two integers, pass their addresses to the function, and display their values before and after the swap. Use pointers to directly manipulate the variable values.

(c) Identify whether the following pointer declarations are valid or invalid. Explain your answer.

(i) char* ptr = &someCharVariable;

(ii) int* ptr, ptr2;

(iii) float* ptr = new float;

(iv) int** ptr1;

(v) double ptr*;

7. Explain the following :

(i) Function Overloading

(ii) Arrays in C++

(iii) Inheritance.