

This question paper contains 10 printed pages]

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S. No. of Question Paper : 3527

Unique Paper Code : 2344001101

Name of the Paper : GE : Programming Using C++

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

Semester : I

Duration : 3 Hours

Maximum Marks : 90

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

Paper has two sections. All the questions in Section A are compulsory.

Answer any four questions from Section B.

Parts of question must be answered together.

Section A

(Compulsory)

1. (a) Give the C++ syntax for the following :

6

- (i) A constant float with the value 3.14.
- (ii) The function prototype of an inline function F1 that accepts two parameters and returns their sum.
- (iii) Function prototype for a function that takes a reference parameter.
- (iv) Declaration of a Class with a Member Template Function.
- (v) Declaration for an array of pointers to integers (array holding integer pointers).
- (vi) The prototype of a destructor function.

P.T.O.

(b) Find the errors, if any in the following C++ code and rewrite the correct code : 10

- (i)

```
#include <iostream>
using namespace std;
int main()
{   int a=5;
    cout<<b<<endl;
    return 0;
}
```
- (ii)

```
#include<iostream>
using namespace std;
int fun (int x, int y)
{   return x + y;
}
double fun(int x,int y)
{   return x * y;
}
int main()
{   cout<<fun(5,10);
    return 0;
}
```
- (iii)

```
#include <iostream>
using namespace std;
void recursiveFunction()
{   recursiveFunction();
}
int main()
{   recursiveFunction();
    return 0;
}
```
- (iv)

```
#include <iostream>
using namespace std;
int sum(int a, int b)
{   cout<<"Adding "<<a<<" and"<<b<<endl;
}
int main()
{   int result=sum(5,10);
    cout<<"Result: "<<result<<endl;
    return 0;
}
```

```

(v) #include <iostream>
using namespace std;
class Car
{ public:
    Car(int speed, string color)
    {   this->speed=speed;
        this->color=color;
    }
    void display()
    {   cout<<"Speed: "<<speed<<
        ", Color:"<<color<<endl;
    }
private:
    int speed;
    string color;
};
int main()
{   Car car;
    car.display();

    return 0;
}

```

- (c) Find the output of the following C++ code after the execution by giving suitable reasons : 2

```

#include <iostream>
using namespace std;
int main()
{   int x=10,y=5,z=0;
    z= x > y ? x : y > 0 ? y : 0;
    cout<<"Result: "<<z<<endl;
    return 0;
}

```

- (d) What will be the output of this program ? Describe how the recursive calls handle both even and odd exponents. 4

```
#include <iostream>
using namespace std;
int power(int x, int y)
{   cout<<"power("<<x<<" , "<<y<<" )"<<endl;
    if (y == 0) return 1;
    int temp = power(x, y / 2);
    if (y%2 == 0)
        return temp*temp;
    else
        return x*temp*temp;
}
int main() :
{   cout<<"Result: "<<power(2,5)<<endl;
    return 0;
}
```

- (e) Write a function to search a given element in a set of N numbers using Binary Search. 4
- (f) How can you calculate the number of elements between two pointers pointing to different elements within the same array ? Write a C++ program to demonstrate this. 4

Section B

2. (a) Suppose p, q, and r are int variables and p = 8, q = 4. What value is assigned to p, q, and r after each statement is executed? 3
- ```
p = (q--) * 2;
r = 5 * p + (++q);
```

- (b) Write a function `isPrime(int n)` that checks if a given number  $n$  is prime. Write a main function that reads an integer  $N$  from the user and uses `isPrime` to print whether the number is prime or not. 7
- (c) What is encapsulation in OOP, and why is it important ? Describe how encapsulation helps in maintaining and securing code. 5
3. (a) Find the errors in the following program and give the correct statements : 6

```
(i) #include <iostream>
 using namespace std;
 int main()
 { int i = 1, sum = 0;
 while (i <= 10)
 sum += i;
 i++;
 cout << "Sum: " << sum << endl;
 return 0;
 }

(ii) #include <iostream>
 using namespace std;
 int main()
 { char c = 100;
 int num = "Hello World";
 cout << "Value: " << c << endl;
 cout << "Value: " << num << endl;
 return 0;
 }

(iii) #include<iostream>
 using namespace std;
 class des
 { public:
 des(int x)
 { cout<<"Constructor called with
 value:"<<x<<endl;
 }
 ~des(int x)
 { cout<<"hi";}
 };
 int main()
 { des obj(10);
 return 0;
 }
```

(b) Write a program in C++ having the following properties : 9

- Define a class having two data variables of integer type in private scope. Array of objects should be declared in main function.
- Input the data variables using a member function named as void get\_data() in public scope.
- Increment the values of data variables by one using a member function named void update\_data() in public scope having array of object as an argument.
- For displaying the updated value of data variables, create a member function named as void showdata() in public scope.

4. Create a class called LibraryBook to track books in a library. The class should meet the following specifications :  $2+4+3+6=15$

(i) Data Members :

- bookID (an integer to uniquely identify each book).
- title (a string representing the title of the book).
- copies (an integer to store the number of copies of the book available).
- A static integer data member totalBooks to keep track of the total number of books created.

(ii) Constructor Requirements :

- Define a parameterized constructor to initialize bookID and title with user-specified values. If the number of copies is unknown, it should be set to a default of 0 using the constructors default arguments.
- Define a copy constructor that initializes a new book object as a copy of an existing LibraryBook object. This should increment totalBooks but not modify copies for the new object.

(iii) Member Functions :

- `addCopies(int n)`: This function should add `n` copies to the copies count.
- `displayBookInfo()`: This function should display the `bookID`, `title`, and copies for each book.
- A static function `getTotalBooks()` that returns the total count of `LibraryBook` objects created.

(iv) Program Requirements :

- Create a few `LibraryBook` objects to test the class functionality, using the parameterized constructor and the copy constructor.
- Display the information of each book using `displayBookInfo()`.
- Display the total number of `LibraryBook` objects created using `getTotalBooks()`.

5. (a) Write a C++ program that defines a template function `max` which accepts two parameters of any data type and returns the maximum of the two values. Test the function with `int`, `float`, and `char` types. 6

- (b) Design a C++ program to demonstrate multilevel inheritance using the following classes:  
Class `Company` (Base Class) with attributes: `company_name` and `location`.  
Class `Team` (Intermediate Class) : Inherits from `Company` and adds attributes: `team_name` and `project`.

Class `Developer` (Derived Class) : Inherits from `Team` and adds attributes: `developer_name` and `programming_language`.

Use a parameterized constructors to initialize all the class attributes. Create an object of `Developer`, and display details from all the classes: `Company`, `Team`, and `Developer`. 9

6. (a)

6

```
#include <iostream>
using namespace std;
class A
{ public:
 virtual void print()
 { cout << "A::print\n";
 }
};
class B : public A
{ public:
 void print()
 { cout << "B::print\n";
 }
};
class C : public B
{ public:
 void print()
 { cout << "C::print\n";
 }
};
int main()
{ A *a;
 C c;
 a = &c;
 a->print();
 return 0;
}
```

- (i) What will be output of the following program after the execution ? Specify appropriate reasons.
- (ii) If the virtual keyword was removed from the print function in the class A, what would be the output of the program ? Explain why.

(iii) What role does polymorphism play in this code, and how does it improve flexibility in an object-oriented program ?

(b) Write a C++ program that performs basic arithmetic operations (addition, subtraction, multiplication, division). Include exception handling to : Handle division by zero. Handle invalid input for non-numeric data. Handle invalid operator input. The program should allow the user to input two numbers and choose an operator, and then display the result or the appropriate error message. 9

7. (a) Find the output considering the following scenarios. Give appropriate reasons : 6

(i) Suppose numPtr is a pointer to an integer and the size of an int is 4 bytes. Given, numPtr = 5000. What will be the new value of numPtr, if you perform the following pointer arithmetic:

numPtr = numPtr + 3 ?

(ii) Given the array `int arr[ ] = {1, 2, 3, 4, 5}` and ptr is a pointer initialized to point to the first element of arr, what will the expression `*(ptr + 4)` return ?

P.T.O.

(iii)

```
#include <iostream>
using namespace std;
void square(int *snum)
{ cout << "square of 10 is ";
 *snum *= *snum;
}
int main()
{ int num = 10;
 square(&num);
 cout << num;
 return 0;
}
```

- (b) Write a C++ program that opens a file named "sample.txt" in read mode and displays only the first 10 lines. If the file has fewer than 10 lines, it displays all available lines.

: 9