

```

cout << "We read the character " << ch << "" endl;
cin.get(ch);
cout << "We read the character << ch << << endl;
cin.get(ch);
cout.put(ch);
cout<<endl;
getline(cin, s, 't')
cout<<s;
return 0;}

```

(4)

- (ii) Define iterator of a set ? Write the command to define pair type data and its header file.
(2½)

(1000)

[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4471

G

Unique Paper Code : 32357503

Name of the Paper : DSE-1, C++ Programming
for MathematicsName of the Course : **B.Sc. (Hons.) Mathematics
(LOCF)**

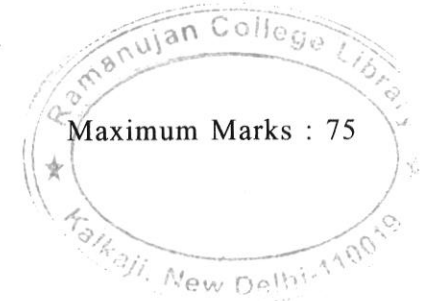
Semester : V

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. This question paper has **six** questions in all.
3. Attempt any **two** parts from each question.
4. **All** questions are compulsory.



P.T.O.

1. (a) (i) Write down a C++ program to find the size of four data type in C++. (2)
- (ii) Write down the C++ commands for finding the maximum and minimum values of two data type. (2)
- (iii) Write a program to find the area of cylinder of radius 'r' and height 'h'. (2)
- (b) (i) Write down the value of y, z and b, c in the following program

```
#include <iostream>
using namespace std;
int main() {
int x,y,z,a,b,c;
x=15;
y=x++*2.2-10%2;
z=z*z;
cout<<y<<endl<<z<<endl;
a=30;
b=a+3.3-z*x%5+y++;
c=c/b;
cout<<c<<endl<<b<<endl;
return 0;
}
```

(2)

- (ii) What is the output of the following program code?

```
int main(){
cout<<setw(10)<<left<<"Rank1:"<<setw(7)<<showpos<<setprecision(7)<<
showpoint<<78.20<<endl;
cout<<setw(10)<<setfill('$')<<"Rank2:"<<setw(7)<<setfill('@')<<70.0<<endl;
return 0; }
```

(2)

- (b) Write a program which takes two permutation maps f and g, using maps in C++ on the set {1,2,3,4}, entered by the user. The program then find the compositions fog and gof of these maps and display the output on the screen. (Composition of f and g is defined as: fog(x) =f(g(x))).

(6½)

- (c) (i) Find the outputs of the following code, if the inputs are 'a b c' and '@jij76tdd' (comma not included) :

```
int main() {
char ch;
string s;
cout << "Enter string"<<endl;
cin >> ch;
```

```

double x;
is >> s1;
is >> x;
is >> s2;
cout << "s1" << s1 << "x" << x << "s2" << s2 << endl;
ostreamstream os;
os << "p";
os << " " << "k";
os << endl;
cout << os.str();

```

6. (a) (i) Consider the class permutation defined as

```

class Permutation {
private:
long n;
long* data;
public:
...
};

```

where the integer n holds the size of the permutation; that is, the permutation is on the integers 1 through n and the array data holds the permutation. Define the copy constructor and assignment operator '=' for the objects of this class. (4½)

- (ii) Write a program which calculate the value of e^{π^e} and π^{e^e} and also compare them. (2)
- (iii) Write a program that takes two complex numbers and perform any two algebraic operation on these complex numbers in C++, using the header file for complex numbers. (2)
- (c) If p_n is the probability that two integers chosen independently and uniformly from $\{1, 2, \dots, n\}$ are relatively prime. Write a program to calculate p_{10} by creating header file gcd.h. (6)

2. (a) Write a C++ program to find the greatest common divisor d of two numbers a and b and also find integers x and y so that $d = ax + by$. 6
- (b) (i) Write a header file named sums.h to find the sum of odd numbers less than a given number. Use this to find the value of this series $1+3+5+7+\dots+101$. (4)
- (ii) Write a program which outputs the following pattern : (2)

```

#####
###
##
#

```

(c) (i) Write the equivalent C++ expressions for the following :

(A) $y = 7(\cos x - \sin x)$; (B) $z = (x - y)^{z^3 - 10}$;

(C) $s = \frac{1}{101} 1p^{31}$; (D) $x = \sin^2 y^2$ (4)

(ii) Evaluate the following expressions :

(A) $8.4 - 32\%4 + \frac{2}{5} + 16 - 17 * 3$

(B) $10/2 - 13.0/5.0 + \text{pow}(4.0,3) + 2.2 * 5$ (2)

3. (a) Design a class called 'PointD3' to represent the point in three dimensional space and having the following features :

(i) It should include three private data variables *a*, *b* and *c* of double type.

(ii) It should include the following two constructors:

A. A default constructor to represent the zero point in 3D space.

B. A three argument constructor to represent the point in 3D space.

(iii) It should include get methods to learn the values held by *a*, *b*, *c*.

```
L.push_front(-12);
list<long>::iterator Li;
Li = L.begin();
Li++;
L.insert(Li,0);
print_list(L);
cout << L.front() << endl;
cout << L.back() << endl;
cout << L.size() << endl;
L.sort();
print_list(L);
L.pop_front();
L.pop_back();
print_list(L);
L.remove_if(is_even);
print_list(L);
return 0;
}
```

(c) (i) Write a program that reads 10 integers from a file "number" and store even and odd numbers in separate files. (4)

(ii) What is the output of the following code :

```
string line("rank 234.44 percentile");
istringstream is(line);
string s1,s2;
```

to 14, and store them in a set A. The program then displays the element of $U(14)$ and order of each element of $U(14)$. (Order of an element x is the least positive integer n such that $x^n = 1$).

(6½)

(b) What is the output of the following program?

```
#include <iostream>
#include <list>
using namespace std;
void print_list (list<long> & L1) {
list<long>::const_iterator Li;
for (Li = L1.begin(); Li != L1.end(); Li++) {
cout << *Li << " ";
}
cout << endl;
}
bool is_even(long n) {
return (n%2 == 0);
}
int main() {
list<long> L;
L.insert(L.begin(),8);
L.insert(L.end(),7);
L.insert(L.begin(),6);
L.push_front(-2);
L.push_back(11);
```

(iv) It should include set methods to modify the coordinates of the point.

(v) It should include an operator == method to check if two points are equal.

(vi) It should include an operator << procedure for printing objects in the form (a,b,c).

Create any two objects P and Q of this class and perform the operator == to check equality and display the result of equality to the screen. (6)

(b) (i) Write a C++ program to generate pseudo random numbers in interval $[0, 2)$ using LCG (linear congruential generator) defined as $x_{n+1} = (a x_n + b) \bmod c$, where $a = 17$, $b = 3$, $c = 64$ and $x_0 = 0$. (4)

(ii) Define static variable using example. (2)

(c) Write a program that prompts the user to input size and data of an array. Display the stored data of the array and find the second largest element in the array; also display index of its first occurrence in the original array. (6)

4. (a) (i) Write the syntax which initializes the pseudo random number generator to a given starting position called seed value in C++ ? Also write the seed value which is used as system time. Write the header file(s) required for this.

(2.5)

- (ii) Write a program which contains a procedure that prompts the user to input a long integer n and returns a random value uniformly in the set $\{1,2,3,\dots,n\}$.

(4)

- (b) (i) What is the output of the following program code :

```
#include<iostream>
using namespace std;
double myfunc(double x, double y);
int main()
{
    double a=70,b=40;
    cout<<myfunc(a,b);
    return 0; }
double myfunc(double x, double y){
    double z=(x>y) ? x:y;
    z*=y; z/=x;
    return z; }
```

(3.5)

- (ii) Write a program which finds all divisors of a given number n (divisor less than n) to check if the sum of divisors is equal to n or not.

(3)

- (c) (i) Point out the syntax errors in the following code with line number :

```
1. #include<iostream>
2. using namespace std;
3. long recursive(long long n);
4. int main()
5. {    long long n;
6.     cout<<" Enter the number n: "
7.     cin>>n;
8.     cout<<"The value of factorial of n is: "<<recursive[n];
9.     return 0 }
```

10. long recursive(long long n) {
11. if (n <= 0) return 0;
12. if (n == 1) return 1;
13. long result = 0;
14. for (long long k=1, k<=n/2; k++;) {
15. if (n%k == 0) result += recursive[k];
16. } return result }

(3.5)

- (ii) Write the inbuilt command for sorting an array data; and also give the required header file.

(2)

- (iii) Write the command to convert an integer type variable to double type.

(1)

5. (a) Write a program to find the elements of $U(14)$, where $U(14)$ is the group under multiplication modulo 14 having elements less than and co-prime