Code No. 91

- Please check that this question paper contains 11 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 7 questions.
- Please write down the serial number of the question before attempting it.

COMPUTER SCIENCE

Time allowed : 3 hours *Maximum Marks : 70*

Instructions :

(i) ***All*** *questions are compulsory.*

(ii) *Programming Language : C++*

1. (a) Differentiate between a default constructor and copy constructor, giving suitable examples of each. 2

(b) Name the header files to which the following belong : 1

(i) puts ( )

(ii) isalnum ( )

(c) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

```
#include <iostream.h>
const int Dividor 5;
void main()
{
   Number=15;
   for (int Count = l;Count=<5;Count++,Number-=3)
      if (Number%Dividor==0)
         cout<<Number / Dividor;
         cout<<endl;
      else
         cout<<Number + Dividor<<endl;
}
```

(d) Find the output of the following program : 3

```
#include<iostream.h>
struct Package
{
       int Length, Breadth, Height;
};
void Occupies(Package M)
{
       cout<<M.Length<<"x"<<M.Breadth<<"x";
       cout<<M.Height<<endl;
}
void main()
{
       Package Pl={100,150,50}, P2, .P3;
       ++P1.Length;
       Occupies(P1);
       P3 = P1;
       ++P3.Breadth;
       P3.Breadth++;
       Occupies (P3);
       P2 = P3;
       P2.Breadth+=50;
       P2. Height--;
       Occupies(P2);
}
```

(e) Find the output of the following program : 2

```
#include<iostream.h>
#include<string.h>
#include<ctype.h>
void Change(char Msg[],int Len)
{
   for (int Count =0; Count<Len; Count++ )
   {
      if (islower(Msg[Count]))
         Msg[Count]= toupper{Msg[Count]);
      else if (isupper(Msg[Count]))
         Msg[Count]= tolower(Msg[Count]);
      else if (isdigit(Msg[Count]))
         Msg[Count]= Msg[Count] + 1;
      else Msg[Count] = '*' ;
   }
```

```
}
void main()
{
   char Message [] = "2005 Tests ahead";
   int Size = strlen(Message);
   Change(Message,Size);
   cout<<Message<<endl;
   for (int C = 0,R=Size-l;C<=Size/2; C++,R--)
   {
       char Temp = Message[C];
       Message[C]= Message[R];
       Message[R]= Temp;
   }
   cout<<Message<<endl;
}
```

(f) Observe the following program GAME.CPP carefully, if the value of Num entered by the user is 14, choose the correct possible output(s) from the options from (i) to (iv), and justify your option. 2

```
//Program : GAME.CPP
#include<stdlib.h>
#include<iostream.h>
void main()
{
   randomize();
   int Num, Rndnum;
   cin>>Num;
   Rndnum = random (Num) + 7;
   for (int N = 1; N<=Rndnum ; N++)
      cout<<N<<" ";
}
```

Output Options :

(i) **1 2 3**

(ii) **1 2 3 4 5 6 7 8 9 10 11**

(iii) **1 2 3 4 5**

(iv) **1 2 3 4**

2. (a) Define the term Data Encapsulation in the context of Object Oriented Programming. Give a suitable example using a C++ code to illustrate the same. 2

(b) Answer the questions (i) and (ii) after going through the following class : 2

```
class Exam
{
       int Marks;
       char Subject[20];
public:
   Exam ()                          //Function 1
   {
      Marks = 0;
      strcpy (Subject,"Computer");
   }
   Exam(char S[])                   //Function 2
   {
      Marks = 0;
      strcpy(Subject,S);
   }
   Exam(int M)                      //Function 3
   {
      Marks = M;
      strcpy(Subject,"Computer");
   }
   Exam(char S[], int M)            //Function 4
   {
      Marks   =   M;
      strcpy    (Subject,S);
   }
};
```

(i) Write statements in C++ that would execute Function 3 and Function 4 of class Exam.

(ii) Which feature of Object Oriented Programming is demonstrated using Function 1, Function 2, Function 3 and Function 4 in the above class Exam ?

(c) Define a class Travel in C++ with the following descriptions : 4

Private Members :

TravelCode	of type long
Place	of type character array (string)
No_of_travellers	of type integer
No_of_buses	of type integer

Public Members :

A constructor to assign initial values of TravelCode as 201, Place as "Nainital", No_of_travellers as 10, No_of_buses as 1

A function NewTravel() which allows user to enter TravelCode, Place and No_of_travellers. Also, assign the value of No_of_buses as per the following conditions :

No_of_travellers	**No_of_buses**
Less than 20	1
Equal to or more than 20 and less than 40	2
Equal to 40 or more than 40	3

A function ShowTravel( ) to display the content from all the data members on screen.

(d) Answer the questions (i) to (iv) based on the following code : 4

```
class Drug
{
    char Category[10];
    char Date_of_manufacture[10];
    char Company[20];
public:
    Drug();
    void enterdrugdetails();
    void showdrugdetails{);
};
class Tablet : public Drug
{
protected:
    char tablet_name[30];
    char Volume_label[20];
public:
    float Price;
    Tablet();
    void entertabletdetails();
    void showtabletdetails ();
};
    class PainReliever : public Tablet
{
    int Dosage_units;
    char Side_effects[20];
    int Use_within_days;
public:
    PainReliever();
    void enterdetails();
    void showdetails();
};
```

(i) How many bytes will be required by an object of class Drug and an object of class PainReliever respectively ?

(ii) Write names of all the data members which are accessible from the object of class PainReliever.

(iii) Write names of all the members accessible from member functions of class Tablet.

(iv) Write names of all the member functions which are accessible from objects of class PainReliever.

3. (a) Write a function in C++ which accepts an integer array and its size as arguments/parameters and exchanges the values of first half side elements with the second half side elements of the array. 3

Example :

If an array of eight elements has initial content as

8, 10, 1, 3, 17, 90, 13, 60

The function should rearrange the array as

17, 90, 13, 60, 8, 10, 1, 3

(b) An array Arr[35][15] is stored in the memory along the row with each of its element occupying 4 bytes. Find out the base address and the address of an element Arr[20][5], if the location Arr[2][2] is stored at the address 3000. 4

(c) Write a function in C++ to perform a DELETE operation in a dynamically allocated queue considering the following description : 4

```
struct Node
{
    float U,V;
    Node *Link;
};
class QUEUE
{
    Node *Rear,*Front;
public:
    QUEUE(){Rear=NULL;Front=NULL;}
    void INSERT();
    void DELETE();
    ~QUEUE();
};
```

(d) Write a function in C++ to print the sum of all the values which are either divisible by 3 or are divisible by 5 present in a two dimensional array passed as the argument to the function. 3

(e) Evaluate the following postfix notation of expression :

```
20  10  +  5  2  *  –  10  /
```

2

4. (a) Observe the program segment given below carefully, and answer the question that follows : 1

```
class Member
{
    int Member_no;
    char Member_name[20];
public :
    //function to enter Member details
    void enterdetails{) ;
    // function to display Member details
    void showdetails();
    //function to return Member_no
    int RMember_no() {return Member_no; }
};
void Update(Member NEW)
{
    fstream File;
    File.open("MEMBER.DAT",ios::binary|ios::in|ios::out);
    Member OM;
    int Recordsread = 0, Found = 0;
    while (!Found && File.read((char*)&OM, sizeof(OM)))
    {
        Recordsread ++;
        if (NEW.RMember_no() == OM.RMember_no())
        {
            _____________________//Missing Statement
            File.write((char*)&NEW, sizeof(NEW));
            Found = 1;
        }
        else
            File.write((char*)&OM, sizeof(OM));
    }
    if (!Found)
        cout<<"Record for modification does not exist";
    File.close();
}
```

If the function Update ( ) is supposed to modify a record in file MEMBER.DAT with the values of Member NEW passed to its argument, write the appropriate statement for **Missing Statement** using seekp( ) or seekg( ), whichever needed, in the above code that would write the modified record at its proper place.

(b) Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file 'STORY.TXT". 2

Example :
If the file "STORY.TXT" contains the following lines,

The rose is red.
A girl is playing there.
There is a playground.
An aeroplane is in the sky.
Numbers are not allowed in the password.

The function should display the output as 3

(c) Given a binary file APPLY.DAT, containing records of the following class Applicant type 3

```
class Applicant
{
    char A_Rno[10];          //Roll number of applicant
    char A_Name[30];         //Name of applicant
    int A_Score;             //Score of applicant
public:
    void Enrol()
    {
          gets (A_Rno); gets (A_Name) ; cin>>A_Score;
    }
    void Status()
    {
          cout<<setw(12)<<A_Admno;
          cout<<setw(32)<<A_Name;
          cout<<setw(3)<<A_Score<<endl;
    }
    int ReturnScore(){return A_Score;}
};
```

Write a function in C++, that would read contents of file APPLY.DAT and display the details of those Students whose A_ Score is below 70.

5. (a) What do you understand by the terms **Candidate Key** and **Cardinality of a relation** in relational database ? 2

(b) Consider the following tables WORKERS and DESIG. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (viii) : 6

WORKERS

W_ID	FIRSTNAME	LASTNAME	ADDRESS	CITY
102	Sam	Tones	33 Elm St.	Paris
105	Sarah	Ackerman	440 U.S. 110	New York
144	Manila	Sengupta	24 Friends Street	New Delhi
210	George	Smith	83 First Street	Howard
255	Mary	Jones	842 Vine Ave.	Losantiville
300	Robert	Samuel	9 Fifth Cross	Washington
335	Henry	Williams	12 Moore Street	Boston
403	Ronny	Lee	121 Harrison St.	New York
451	Pat	Thompson	11 Red Road	Paris

DESIG

W_ID	SALARY	BENEFITS	DESIGNATION
102	75000	15000	Manager
105	85000	25000	Director
144	70000	15000	Manager
210	75000	12500	Manager
255	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
451	28000	7500	Salesman

(i) To display W_ID, Firstname, Address and City of all employees living in New York from the table WORKERS.

(ii) To display the content of WORKERS table in ascending order of LASTNAME.

(iii) To display the Firstname, Lastname, and Total Salary of all Clerks from the tables WORKERS and DESIG, where Total Salary is calculated as Salary + Benefits.

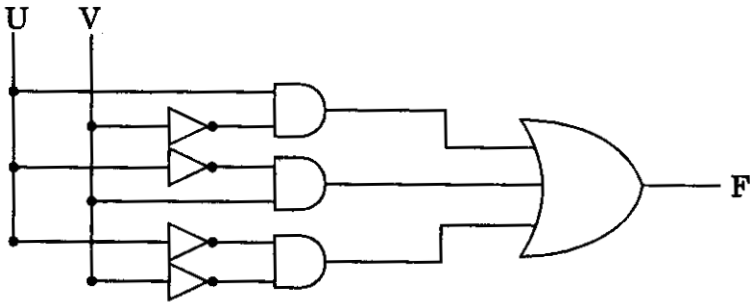
(iv) To display the Minimum salary among Managers and Clerks from the table DESIG.

(v)
```
SELECT FIRSTNAME, SALARY
FROM WORKERS, DESIG
WHERE DESIGNATION = 'Manager' AND
WORKERS.W_ID=DESIG.W_ID;
```

(vi)
```
SELECT COUNT(DISTINCT DESIGNATION) FROM DESIG;
```
(vii)
```
SELECT DESIGNATION, SUM(SALARY)
    FROM DESIG
    GROUP BY DESIGNATION HAVING COUNT(*)<3;
```
(viii)
```
SELECT SUM(BENEFITS)
    FROM WORKERS
    WHERE DESIGNATION = 'Salesman';
```

6. (a) State and verify Absorption law in Boolean Algebra. 2

(b) Write the equivalent Boolean expression for the following Logic Circuit : 2



(c) Write the POS form of a Boolean Function F, which is represented by the following truth table : 1

X	Y	Z	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

(d) Reduce the following Boolean expression using K - Map : 3

F (A, B, C, D) = $\sum$ (0, 1, 2, 3, 4, 5, 10, 11, 15)

7. (a) Compare Optical Fiber and Coaxial transmission media. 1

(b) Expand the following terminologies : 1

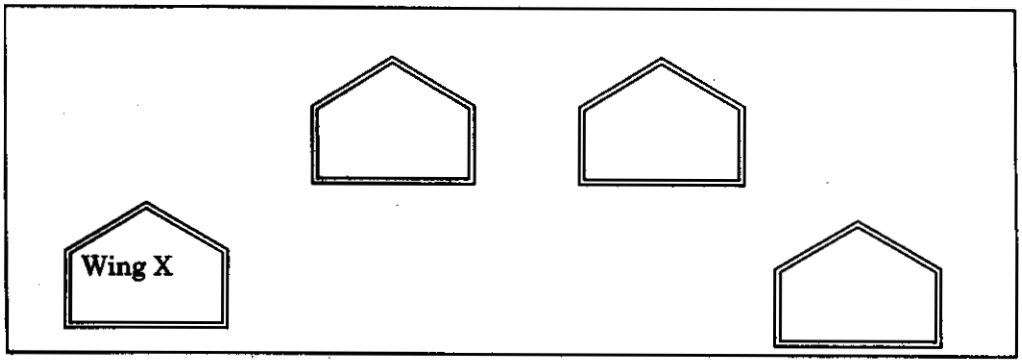
(i) HTML

(ii) GSM

(c) What is the difference between XML and HTML ? Write two differences. 1

(d) What do you understand by the terms Cookies and Firewall ? 1

(e) The Cyber Mind Organisation has set up its new Branch at Mizoram for its office and web based activities. It has 4 Wings of buildings as shown in the diagram :



Center to center distance between various blocks

Wing X to Wing Z	40 m
Wing Z to Wing Y	60 m
Wing Y to Wing X	135 m
Wing Y to Wing U	70 m
Wing X to Wing U	165 m
Wing Z to Wing U	80 m

Number of Computers

Wing X	50
Wing Z	130
Wing Y	40
Wing U	15

(el) Suggest a most suitable cable layout of connections between the Wings and topology. 1

(e2) Suggest the most suitable place (i.e. Wing) to house the server of this organization with a suitable reason with justification. 1

(e3) Suggest the placement of the following devices with justification : 1
(i) Repeater
(ii) Hub/Switch

(e4) The organization is planning to link its head office situated in Delhi with the offices as Mizoram. Suggest an economic way to connect it; the company is ready to compromise on the speed of connectivity. Justify your answer. 1

Question 7(e)

