Roll No. | | | | | | | |

Candidates must write the Code on the title page of the answer-book.

- Please check that this question paper contains **12** 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.**
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

COMPUTER SCIENCE

Time allowed : 3 hours *Maximum Marks : 70*

Instructions :

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

(ii) *Programming Language : C++*

1. (a) Explain in brief the purpose of function prototype with the help of a suitable example. *2*

(b) Name the header files that shall be needed for successful compilation of the following C++ code : *1*

```
void main()
{char str[20],str[20];
gets(str);
strcpy(str1,str);
strrev(str);
puts(str);
puts(str1);    }
```

(c) Deepa has just started working as a programmer in SMART SOFTWARE company. In the company she has got her first assignment to be done using a C++ function to find the smallest number out of a given set of numbers stored in a one-dimensional array. But she has committed some logical mistakes while writing the code and is not getting the desired result. Rewrite the correct code underlining the corrections done. Do not add any additional statements in the corrected code. *2*

```
int find(int a[],int n)
{   int s=a[0];
    for(int x=1;x<n;x++)
    if(a[x]>s)
         a[x]=s;
    return(s);
}
```

(d) Find output of the following program segment : *2*

```
#include<iostream.h>
#include<ctype.h>
void Mycode(char Msg[],char CH)
{
for(int cnt=0;Msg[cnt]!='\0';cnt++)
{ if(Msg[cnt]>='B'&& Msg[cnt]<='G')
      Msg[cnt]=tolower(Msg[cnt]);
else
      if(Msg[cnt]=='N'∪Msg[cnt]=='n'∪Msg[cnt]=='')
           Msg[cnt]=CH;
      else
           if(cnt%2==0)
                Msg[cnt]=toupper(Msg[cnt]);
           else
                Msg[cnt]=Msg[cnt-1];
} }
void main()
{     char MyText[]="Input Raw";
      Mycode(MyText,'@');
      cout<<"NEW TEXT:"<<MyText<<endl; }
```

(e) Find the output of the following program : *3*

```
#include<iostream.h>
void in(int x,int y, int &z)
{ x+=y;
 y--;
z*=(x-y);
}
void out(int z,int y, int &x)
{ x*=y;
  y++;
 z/=(x+y);
}
void main()
{ int a=20, b=30, c=10;
  out(a,c,b);
  cout<<a<<"#"<<b<<"#"<<c<<"#"<<endl;
  in(b,c,a);
  cout<<a<<"@"<<b<<"@"<<c<<"@"<<endl;
  out(a,b,c);
  cout<<a<<"$"<<b<<"$"<<c<<"$"<<endl;
}
```

(f) Write a user defined function DIVT() which takes an integer as parameter and returns whether it is divisible by 13 or not. The function should return 1 if it is divisible by 13, otherwise it should return 0. *2*

2. (a) Explain data hiding with an example. *2*

(b) Define a class **CONTEST** in C++ with the following description : *4*

Private Data Members

Eventno	integer
Description	char(30)
Score	integer
qualified	char

Public Member functions

- A constructor to assign initial values Eventno as 11, Description as "School level", Score as 100, qualified as 'N'.
- Input() – To take the input for Eventno, description and score.
- Award (int cutoffscore) – To assign qualified as 'Y', if score is more than the cutoffscore that is passed as argument to the function, else assign qualified as 'N'.
- Displaydata() – to display all data members.

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

```
class schoolbag
{
int pockets;
public:
schoolbag()                 //Function 1
{ pockets=30;
cout<<"The bag has pockets"<<end1;
}
void company()              //Function 2
{
cout<<"The company of the Bag is ABC"<<end1;
}
schoolbag(int D)            //Function 3
{
pockets=D;
cout<<"Now the Bag has pockets"<<pockets<<end1;
}
~schoolbag()                //Function 4
{
cout<<"Thanks"<<end1;
}
};
```

(i) In Object Oriented Programming, what is Function 4 referred as and when does it get invoked/called ?

(ii) In Object Oriented Programming, which concept is illustrated by Function 1 and Function 3 together ?

(d) Consider the following class state : *4*

```
class State
{
protected:
  int tp; //no. of tourist places
public:
  State()
  {
  tp = 0;
  }
  void inctp()
  {
  tp++;
  }
  int gettp()
  {
  return tp;
  }
};
```

Write a code in C++ to publically derive another class 'District' with the following additional members derived in the Public visibility mode.

Data Members

distname – char (50)

population – long

Member functions :

- dinput() – To enter distname and population.
- doutput() – To display distname and population on screen.

3. (a) Write a function in C++ TWOTOONE() which accepts two array X[ ], Y[ ] and their size n as argument. Both the arrays X[ ] and Y[ ] have the same number of elements. Transfer the content from two arrays X[ ], Y[ ] to array Z[ ]. The even places (0,2,4...) of array Z[ ] should get the contents from the array X[ ] and odd places (1,3,5...) of array Z[ ] should get the contents from the array Y[ ]. *3*

Example : If the X[ ] array contains 30,60,90 and the Y[ ] array contains 10,20,50. Then Z[ ] should contain 30,10,60,20,90,50.

(b) Given an array A[10][12] whose base address is 10000. Calculate the memory location of A[2][5] if each element occupies 4 bytes and array is stored columnwise. *3*

(c) Define member function delque() to perform delete operation on a linked queue where each node has the following structure : *4*

```
struct node
{
char name[20]
int marks;
node *link;
};
class queue
{
node *front,*rear;
public:
queue() {front=rear=NULL;
}
void delque();
};
```

(d) Write a function in C++ which accepts a 2D array of integers and its size arguments and displays the elements which lie on minor diagonal. [Top right to bottom left diagonal] *2*
[Assuming the 2D array to be square matrix with odd dimension i.e. 3×3, 5×5, $7, \times 7$, etc ...]

For example

If the 2D array is

6	7	8
1	3	6
7	9	3

The following should be displayed :

8
3
7

(e) Evaluate the following postfix expression : 2

(show status of Stack after each operation)

100,40,8,/,20,10,–,+,*

4. (a) A binary file "games.dat" contains data of 10 games where each game's data is an object of the following class : 1

```
class game
{
int gameno;
char game_name[20];
public:
void enterdetails(){cin>>gameno; gets(game_name);}
void enterdetails(){cout<<gameno<<endl<<game_name;}
};
```

With reference to this information, write C++ statement in the blank given below to move the file pointer to the end of file.

```
ifstream ifile;
game G;
ifile.open("games.dat",ios::binary|ios::in);
_____________________________________
cout<<ifile.tellg();
```

(b) Write a function Countaroma() to count and display the number of times "Aroma" occurs in a text file "Cook.txt". 2

Note : Only complete word "Aroma" should be counted. Words like "Aromatic" should not be counted.

(c) Given a binary file "SPORTS.DAT" containing records of the following class : 3

```
class Player
{ char PNO[10];//player number
  char Name[20];//Name of player
  int rank;//rank of the player
     public:
  void EnterData()
  {gets(PNO);gets(Name);cin>>rank;
  }
   void DisplayData()
   { cout<<setw(12)<<PNO;
     cout<<setw(32)<<Name;
     cout<<setw(3)<<rank<<endl;
   }
    int Ret_rank() {return rank;}
  };
```

Write a function in C++ that would read contents of the file "SPORTS.DAT" and display the details of those players whose rank is above 500.

5. (a) Observe the following table and answer the parts (i) and (ii) : 2

Table : Store

ItemCode	Item	Qty	Rate
10	Gel Pen Classic	1150	25
11	Sharpener	1500	10
12	Ball Pen 0·5	1600	12
13	Eraser	1600	5
15	Ball Pen 0·25	800	20

(i) In the above table, can we have Qty as primary key.[Answer as yes/no]. Justify your answer.

(ii) What is the cardinality and degree of the above table ?

Consider the following tables **SCHOOL** and **ADMIN** and answer (b) and (c) parts of this question :

Table : SCHOOL

CODE	TEACHERNAME	SUBJECT	DOJ	PERIODS	EXPERIENCE
1001	RAVI SHANKAR	ENGLISH	12/03/2000	24	10
1009	PRIYA RAI	PHYSICS	03/09/1998	26	12
1203	LISA ANAND	ENGLISH	09/04/2000	27	5
1045	YASHRAJ	MATHS	24/08/2000	24	15
1123	GANAN	PHYSICS	16/07/1999	28	3
1167	HARISH B	CHEMISTRY	19/10/1999	27	5
1215	UMESH	PHYSICS	11/05/1998	22	16

Table : ADMIN

CODE	GENDER	DESIGNATION
1001	MALE	VICE PRINCIPAL
1009	FEMALE	COORDINATOR
1203	FEMALE	COORDINATOR
1045	MALE	HOD
1123	MALE	SENIOR TEACHER
1167	MALE	SENIOR TEACHER
1215	MALE	HOD

(b) Write SQL statements for the following : *4*

(i) To display TEACHERNAME, PERIODS of all teachers whose periods are more than 25.

(ii) To display all the information from the table SCHOOL in descending order of experience.

(iii) To display DESIGNATION without duplicate entries from the table ADMIN.

(iv) To display TEACHERNAME, CODE and corresponding DESIGNATION from tables SCHOOL and ADMIN of Male teachers.

(c) Give the output of the following SQL queries : *2*

(i) SELECT DESIGNATION, COUNT (*) FROM ADMIN GROUP BY DESIGNATION HAVING COUNT (*) <2;

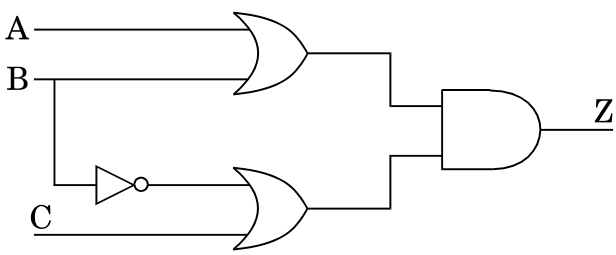
(ii) SELECT max (EXPERIENCE) FROM SCHOOL;

(iii) SELECT TEACHERNAME FROM SCHOOL WHERE EXPERIENCE >12 ORDER BY TEACHERNAME;

(iv) SELECT COUNT (*), GENDER FROM ADMIN GROUP BY GENDER;

6. (a) State Distributive law and verify it using truth table. *2*

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



(c) Convert the following Boolean expression into its equivalent Canonical Sum of Products form (SOP) :

(U + V + W) (U + V + W′) (U′ + V + W) (U′ + V′ + W′) *1*

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

F(A,B,C,D)= Π(0,1,2,4,5,6,8,10)

7. (a) Write any two differences between twisted pair and coaxial cable. *2*

(b) Define the following : *2*

(i) Firewall

(ii) VoIP

(c) Write any **two** examples of Server side Scripts. *1*

(d) What is cloud computing ? *1*

(e) Vidya Senior Secondary Public School in Nainital is setting up the network between its different wings. There are 4 wings named as SENIOR(S), JUNIOR(J), ADMIN(A) and HOSTEL(H). *4*

Distance between various wings are given below :

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

Wing	Number of Computers
Wing A	20
Wing S	150
Wing J	50
Wing H	25

(i) Suggest a suitable Topology for networking the computers of all wings.

(ii) Name the most suitable wing where the Server should be installed. Justify your answer.

(iii) Suggest where all should Hub(s)/Switch(es) be placed in the network.

(iv) Which communication medium would you suggest to connect this school with its main branch in Delhi ?