Series: SOS		Code No. 083/1

Roll No. ☐☐☐☐☐☐☐

Candidates must write the code on the title page of the answer-book

Please check that this question paper contains **13 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.

Second Pre-Board Examination, 2018-2019
Computer Science

Grade: 12

Time allowed: 3 hours

Date: 27.01. 2019

Maximum Marks: 70

<u>General Instructions:</u>
(i) Programming Language in **SECTION A : C++**
(ii) Programming Language in **SECTION B : Python**
(iii) Answer either SECTION **A** or **B**, and SECTION **C** is compulsory.
(iv) It is compulsory to mention on the *page 1* in answer book whether you are attempting SECTION **A** or SECTION **B**.
(v) **All** questions are compulsory within each section.
(vi) Read questions carefully before answering them.
(vii) Write neatly. Rough work may be done neatly in a working column or on the last page of your main sheet.
(viii) Write question numbers correctly.

SECTION – A
(Only for Candidates, who opted for C++)

<u>Answer the following questions</u>

Q1.
   a) Write the type of C++ tokens (keywords and user defined identifiers) from the following : [2]
      (i) new

      (ii) While

      (iii) case

      (iv) Num_2

b) Akhil typed the following C++ code and during compilation he found four errors as follows:

[1]

    (i) Function strlen should have a prototype
    (ii) Undefined symbol cout
    (iii) Undefined symbol endl
    (iv) Function getchar should have a prototype

On asking his teacher told him to include necessary header files in the code. Write the names of the header files, which Anil needs to include, for successful compilation and execution of the following code:

```
void main()
{
  char S[ ] = "Hello";
  for(int i = 0; i<strlen(S); i++)
  S[i] = S[i]+1;
  cout<<S<<end1;
  getchar();
}
```

c) Rewrite the following C++ code after removing any/all syntactical errors with each correction underlined. [2]
Note: Assume all required header files are already being included in the program.

```
void main()
{
    cout<<"Enter an Alphabet:";
    cin>>CH;
    switch(CH)
            case „A" cout<<"Ant"; Break;
            case „B" cout<<"Bear" ; Break;
}
```

d) Find and write the output of the following C++ program code: [2]
Note : Assume all required header files are already included in the program.

```
 #define Diff(N1,N2)        ((N1>N2)?N1-N2:N2-N1)
void main()
{
  int A,B,NUM[ ] = {10,23,14,54,32};
  for(int CNT =4; CNT>0; CNT- -)
   {
    A=NUM[CNT];
    B=NUM[CNT-1];
    cout<<Diff(A,B)<<'#';
   }
}
```

e) Find and write the output of the following C++ program code : [3]

Note : Assume all required header files are already being included in the program.

```cpp
void main()
{
  int A[ ]={10,12,15,17,20,30};
  for(int i = 0; i<6; i++)
  {
    if(A[i]%2==0)
    A[i] /= 2;
    else if(A[i]%3==0)
    A[i] /= 3;
    if(A[i]%5==0)
    A[i] /=5;
  }
  for(i = 0; i<6; i++)
  cout<<A[i]<<"#";
}
```

f) Look at the following C++ code and find the possible output(s) from the options (i) to (iv) following it. Also, write the maximum values that can be assigned to each of the variables R and C. [2]

Note :

• Assume all the required header files are already being included in the code.

• The function random(n) generates an integer between 0 and n – 1.

```cpp
void main()
{
    randomize();
    int R=random(3),C=random(4);
    int MAT[3][3] = {{10,20,30},{20,30,40},{30,40,50}};
    for(int I=0; I<R; I++)
    {
        for(int J=0; J<C; J++)
        cout<<MAT[I][J]<<" ";
        cout<<end1;
    }
}
```

(i)	(ii)
10 20 30 20 30 40 30 40 50	10 20 30 20 30 40
(iii)	(iv)
10 20 20 30	10 20 20 30 30 40

Q2.

a) Differentiate between protected and private members of a class in context of Object Oriented Programming. Also give a suitable example illustrating accessibility/non-accessibility of each using a class and an object in C++.   [2]

b) Observe the following C++ code and answer the questions (i) and (ii).

   Note : Assume all necessary files are included.

```
class EXAM
{
 long Code;
 char EName[20];
 float Marks;
 public:
 EXAM()                 //Member Function 1
 {
  Code=100;
  strcpy(EName,"Noname");
  Marks=0;
 }
 EXAM(EXAM &E)      //Member Function 2
 {
  Code=E.Code+1;
  strcpy(EName,E.EName);
  Marks=E.Marks;
 }
};
void main()
 {
  _____        //Statement 1
  _____        //Statement 2
 }
```

(i) Which Object Oriented Programming feature is illustrated by the Member Function 1 and Member Function 2 together in the class EXAM ? [1]

(ii) Write Statement 1 and Statement 2 to execute Member Function 1 and Member Function 2 respectively. [1]

c) Write the definition of a class BOX in C++ with the following description : [4]

Private Members

- BoxNumber   // data member of integer type
- Side   // data member of float type
- Area   // data member of float type
- ExecArea()   // Member function to calculate and assign
                     // Area as Side * Side

Public Members

- GetBox()   // A function to allow user to enter values of
                     // BoxNumber and Side. Also, this function should call
                     //ExecArea() to calculate Area
- ShowBox()   // A function to display BoxNumber, Side and Area

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

```
class One
{
        int A1;
protected:
        float A2;
public:
        One();
        void Get1();
        void Show1();
};
class Two : private One
{
        int B1;
protected:
        float B2;
public:
        Two();
        void Get2();
        void Show();
};
Class Three : public Two
{
```

```
        int C1;
public:
        Three();
        void Get3();
        void Show();
};
void main()
{
        Three T;              //Statement 1
        _____;           //Statement 2
}
```

(i)   Which type of Inheritance out of the following is illustrated in the above example?
        – Single Level Inheritance, Multilevel Inheritance, Multiple Inheritance
(ii)   Write the names of all the member functions, which are directly accessible by the
        object T of class Three as declared in main( ) function.
(iii)   Write Statement 2 to call function Show ( ) of class Two from the object T of class
        Three.
(iv)   What will be the order of execution of the constructors, when the object T of class
        Three is declared inside main ( )?

Q3.

a) Write the definition of a function Reverse(int Arr[], int N) in C++, which should reverse the
entire content of the array Arr having N elements, without using any other array.   [3]

Example : if the array Arr contains

13	10	15	20	5

Then the array should become

5	20	15	10	13

Note :
• The function should only rearrange the content of the array.
• The function should not copy the reversed content in another array.
• The function should not display the content of the array.

b) Write a definition for a function SUMMIDCOL(int MATRIX[][10], int N,int M) in C++, which
finds the sum of the middle column‖s elements of the MATRIX (Assuming N represents
number of rows and M represents number of columns, which is an odd integer).   [2]

Example : If the content of array MATRIX having N as 5 and M as 3 is as follows :

1	**2**	1
2	**1**	4
3	**4**	5
4	**5**	3
5	**3**	2

The function should calculate the sum and display the following:
    Sum of Middle Column: 15

c) T[25][30] is a two dimensional array, which is stored in the memory along the row with each of its element occupying 2 bytes, find the address of the element T[10] [15], if the element T[5] [10] is stored at the memory location 25000.   [3]

d) Write the definition of a member function PUSHGIFT() for a class STACK in C++, to add a GIFT in a dynamically allocated stack of GIFTs considering the following code is already written as a part of the program :   [4]

```
struct GIFT
{
 int GCODE;            //Gift Code
 char GDESC[20];       //Gift Description
 GIFT *Link;
};
class STACK
{
     Gift *TOP;
  public:
     STACK()
     {
     TOP=NULL;
     }
     void PUSHGIFT();
     void POPGIFT();
     ~STACK();
};
```

e) Convert the following Infix expression to its equivalent Postfix expression, showing the stack contents for each step of conversion :   [2]

        X – (Y + Z) / U * V

Q4.

a) Polina Raj has used a text editing software to type some text in an article. After saving the article as MYNOTES.TXT, she realised that she has wrongly typed alphabet K in place of alphabet C everywhere in the article.

Write a function definition for **PURETEXT()** in C++ that would display the corrected version of the entire article of the file MYNOTES.TXT with all the alphabets "K" to be displayed as an alphabet "C" on screen. [3]

Note : Assuming that MYNOTES.TXT does not contain any C alphabet otherwise.

Example : If Polina has stored the following content in the file MYNOTES.TXT :

```
I OWN A KUTE LITTLE KAR.

I KARE FOR IT AS MY KHILD.
```

The function PURETEXT() should display the following content :

```
I OWN A CUTE LITTLE CAR.

I CARE FOR IT AS MY CHILD.
```

b) Write a definition for function COUNTDEPT( ) in C++ to read each object of a binary file TEACHERS.DAT, find and display the total number of teachers in the department MATHS. Assume that the file TEACHERS.DAT is created with the help of objects of class TEACHERS, which is defined below : [2]

```
class TEACHERS
  {
     int TID; char DEPT[20];
  public:
  void GET()
   {
     cin>>TID;gets(DEPT);
   }
  void SHOW()
   {
    cout<<TID<<":"<<DEPT<<end1;
   }
   char *RDEPT()
    {
      return DEPT;
    }
  };
```

c) Find the output of the following C++ code considering that the binary file BOOK.DAT exists on the hard disk with a data of 200 books. [1]

```cpp
class BOOK
{
int BID;
char BName[20];
public:
   void Enter();
   void Display();
};
void main()
{
  fstream InFile;
  InFile.open("BOOK.DAT",ios::binary|ios::in);
  BOOK B;
  InFile.seekg(5*sizeof(B));
  InFile.read((char*)&B, sizeof(B));
  cout<<"Book Number:"<<InFile.tellg()/sizeof(B) + 1;
  InFile.seekg(0,ios::end);
  cout<<" of "<<InFile.tellg()/sizeof(B)<<end1;
  InFile.close();
}
```

SECTION – B
(Only for Candidates, who opted for Python)

…………………………..
………………………….

SECTION – C
(For all the Candidates)

Q5.

a) Observe the following table MEMBER carefully and write the name of the RDBMS operation out of (i) SELECTION (ii) PROJECTION (iii) UNION (iv) CARTESIAN PRODUCT, which has been used to produce the output as shown in RESULT. Also, find the Degree and Cardinality of the RESULT : [2]

MEMBER

NO	MNAME	STREAM
M001	JAYA	SCIENCE
M002	ADITYA	HUMANITIES
M003	HANSRAJ	SCIENCE
M004	SHIVAK	COMMERCE

RESULT

NO	MNAME	STREAM
M002	ADITYA	HUMANITIES

b) Write SQL queries for (i) to (iv) and find outputs for SQL queries (v) to (viii), which are based on the tables : [6]

TABLE : BOOK

Code	BNAME	TYPE
F101	The priest	Fiction
L102	German easy	Literature
C101	Tarzan in the lost world	Comic
F102	Untold Story	Fiction
C102	War heroes	Comic

TABLE : MEMBER

MNO	MNAME	CODE	ISSUEDATE
M101	RAGHAV SINHA	L102	2016-10-13
M103	SARTHAK JOHN	F102	2017-02-23
M102	ANISHA KHAN	C101	2016-06-12

(i)   To display all details from table MEMBER in descending order of ISSUEDATE.
(ii) To display the BNO and BNAME of all Fiction Type books from the table BOOK.
(iii) To display the TYPE and number of books in each TYPE from the table BOOK.
(iv) To display all MNAME and ISSUEDATE of those members from table MEMBER who have books issued (i.e. ISSUEDATE) in the year 2017.
(v)   SELECT MAX(ISSUEDATE) FROM MEMBER;
(vi) SELECT DISTINCT TYPE FROM BOOK;
(vii) SELECT A.CODE,BNAME,MNO,MNAME
      FROM BOOK A, MEMBER B WHERE A.CODE=B.CODE;
(viii) SELECT BNAME FROM BOOK
      WHERE TYPE NOT IN ("FICTION","COMIC");

Q6.

a) State DeMorgan's Laws of Boolean Algebra and verify them using truth table.   [2]

b) Draw the Logic Circuit of the following Boolean Expression using only NOR Gates :   [2]
(A+B).(C+D)

c) Derive a Canonical POS expression for a Boolean function G, represented by the following truth table :   [1]

X	Y	Z	G(X,Y,Z)
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

d) Reduce the following Boolean Expression to its simplest form using K-Map :   [3]

$$E (U,V,Z,W) = \sum(2,3,6,8,9,10,11,12,13)$$

Q7.

a) Differentiate between communication using Optical Fiber and Ethernet Cable in context of wired medium of communication technologies.   [2]

b) Janish Khanna used a pen drive to copy files from his friendlls laptop to his office computer. Soon his computer started abnormal functioning. Sometimes it would restart by itself and sometimes it would stop different applications running on it. Which of the

following options out of (i) to (iv), would have caused the malfunctioning of the computer? Justify the reason for your chosen option : [2]

(i) Computer Virus
(ii) Spam Mail
(iii) Computer Bacteria
(iv) Trojan Horse

c) Ms. Raveena Sen is an IT expert and a freelancer. She recently used her skills to access the Admin password for the network server of Super Dooper Technology Ltd. and provided confidential data of the organization to its CEO, informing him about the vulnerability of their network security. Out of the following options (i) to (iv), which one most appropriately defines Ms. Sen? [2]
Justify the reason for your chosen option :

(i) Hacker
(ii) Cracker
(iii) Operator
(iv) Network Admin

d) Hi Standard Tech Training Ltd. is a Mumbai based organization which is expanding its office set-up to Chennai. At Chennai office compound, they are planning to have 3 different blocks for Admin, Training and Accounts related activities. Each block has a number of computers, which are required to be connected in a network for communication, data and resource sharing.
As a network consultant, you have to suggest the best network related solutions for them for issues/problems raised by them in (i) to (iv), as per the distances between various blocks/locations and other given parameters.
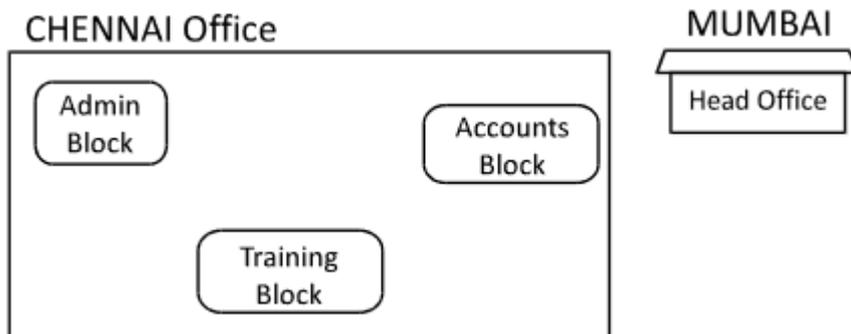
Shortest distances between various blocks/locations:

Admin Block to Accounts Block	300 Metres
Accounts Block to Training Block	150 Metres
Admin Block to Training Block	200 Metres
MUMBAI Head Office to CHENNAI Office	1300 Km

Number of computers installed at various blocks are as follows:

Training Block	150
Accounts Block	30
Admin Block	40

(i) Suggest the most appropriate block/location to house the SERVER in the CHENNAI office (out of the 3 blocks) to get the best and effective connectivity.
Justify your answer. [1]

(ii) Suggest the best wired medium and draw the cable layout (Block to Block) to efficiently connect various blocks within the CHENNAI office compound. [1]

(iii) Suggest a device/software and its placement that would provide data security for the entire network of the CHENNAI office. [1]

(iv) Suggest a device and the protocol that shall be needed to provide wireless Internet access to all smartphone/laptop users in the CHENNAI office. [1]