Series GBM

Code No. **91**

Roll No.

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

- Please check that this question paper contains **20** 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 minute 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*

General Instructions :

(i)   SECTION A refers to programming language C++.

(ii)   SECTION B refers to programming language Python.

(iii)   SECTION C is compulsory for all.

(iv)   Answer either SECTION A or SECTION B.

(v)   It is compulsory to mention on the page 1 in the answer book whether you are attempting SECTION A or SECTION B.

*(vi)   **All** questions are compulsory within each section.*

SECTION A

[Only for candidates, who opted for C++]

1. (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) Anil typed the following C++ code and during compilation he found three errors as follows :

   (i) Function strlen should have prototype

   (ii) Undefined symbol cout

   (iii) Undefined symbol endl

   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 : *1*

```cpp
void main()
{
    char Txt[] = "Welcome";
    for(int C= 0; C<strlen(Txt); C++)
      Txt[C] = Txt[C]+1;
    cout<<Txt<<endl;
}
```

   (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.

```cpp
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.

```cpp
#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 *Point, Score[]={100,95,150,75,65,120};
    Point = Score;
    for(int L = 0; L<6; L++)
    {
        if((*Point)%10==0)
            *Point /= 2;
        else
            *Point -= 2;
        if((*Point)%5==0)
            *Point /= 5;
        Point++;
    }
    for(int L = 5; L>=0; L--)
      cout<<Score[L]<<"*";
}
```

(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 N and M. *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 N=random(3),M=random(4);
    int DOCK[3][3] = {{1,2,3},{2,3,4},{3,4,5}};


    for(int R=0; R<N; R++)
    {
        for(int C=0; C<M; C++)
            cout<<DOCK[R][C]<<" ";
        cout<<endl;
    }
}
```

(i)	(ii)
1 2 3 2 3 4 3 4 5	1 2 3 2 3 4
(iii)	(iv)
1 2 2 3	1 2 2 3 3 4

2. (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.

```cpp
class TEST
{
    long TCode;
    char TTitle[20];
    float Score;
public:
    TEST()                              //Member Function 1
    {
        TCode=100;strcpy(TTitle,"FIRST Test");Score=0;
    }
    TEST(TEST &T)                       //Member Function 2
    {
        TCode=E.TCode+1;
        strcpy(TTitle,T.TTitle);
        Score=T.Score;
    }
};

void main()
{
    _____                     //Statement 1
    _____                     //Statement 2
}
```

(i) Which Object Oriented Programming feature is illustrated by the Member Function 1 and the Member Function 2 together in the class TEST ? *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 First
{
    int X1;
protected:
    float X2;
public:
    First();
    void Enter1(); void Display1();
};
```

```
class Second : private First
{
    int Y1;
protected:
    float Y2;
public:
    Second();
    void Enter2();
    void Display();
};

class Third : public Second
{
    int Z1;
public:
    Third();
    void Enter3();
    void Display();
};
void main()
{
    Third 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 Third as declared in main() function.

(iii) Write Statement 2 to call function Display() of class Second from the object T of class Third.

(iv) What will be the order of execution of the constructors, when the object T of class Third is declared inside main() ?

3. (a) Write the definition of a function AddUp(int Arr[], int N) in C++, in which all even positions (i.e., 0,2,4,...) of the array should be added with the content of the element in the next position and odd positions (i.e., 1,3,5,...) elements should be incremented by 10. *3*

Example : if the array Arr contains

23	30	45	10	15	25

Then the array should become

53	40	55	20	40	35

Note :

- The function should only alter the content in the same array.
- The function should not copy the altered content in another array.
- The function should not display the altered content of the array.
- Assuming, the Number of elements in the array are Even.

(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) ARR[15][20] is a two-dimensional array, which is stored in the memory along the row with each of its elements occupying 4 bytes. Find the address of the element ARR[5][15], if the element ARR[10][5] is stored at the memory location 35000. *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*

$$X - (Y + Z) / U * V$$

4. (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 COUNTPICS( ) in C++ to read each object of a binary file PHOTOS.DAT, find and display the total number of PHOTOS of type PORTRAIT. Assume that the file PHOTOS.DAT is created with the help of objects of class PHOTOS, which is defined below : *2*

```cpp
class PHOTOS
{
    int PCODE;
    char PTYPE[20];//Photo Type as "PORTRAIT","NATURE"
public:
    void ENTER()
    {
        cin>>PCODE;gets(PTYPE);
    }

    void SHOWCASE()
    {
        cout<<PCODE<<":" <<PTYPE<<endl;
    }
    char *GETPTYPE(){return PTYPE;}
};
```

(c) Find the output of the following C++ code considering that the binary file CLIENTS.DAT exists on the hard disk with a data of 200 clients : *1*

```
class CLIENTS
{
    int CCode;char CName[20];
public:
    void REGISTER(); void DISPLAY();
};

void main()
{
    fstream File;
    File.open("CLIENTS.DAT",ios::binary|ios::in);
    CLIENTS C;
    File.seekg(6*sizeof(C));
    File.read((char*)&C, sizeof(C));
    cout<<"Client Number:"<<File.tellg()/sizeof(C) + 1;
    File.seekg(0,ios::end);
    cout<<" of "<<File.tellg()/sizeof(C)<<endl;
    File.close();
}
```

SECTION B

[Only for candidates, who opted for Python]

1. (a) Which of the following can be used as valid variable identifier(s) in Python ? *2*

   (i)   **4thSum**

   (ii) **Total**

   (iii) **Number#**

   (iv) **_Data**

P.T.O.

Courtesy : CBSE

(b) Name the Python Library modules which need to be imported to invoke the following functions : *1*

    (i)   `floor()`

    (ii)   `randint()`

(c) Rewrite the following code in Python after removing all syntax error(s). Underline each correction done in the code. *2*

```
STRING=""WELCOME
NOTE""
for S in range[0,8]:
    print STRING(S)
print S+STRING
```

(d) Find and write the output of the following Python code : *2*

```
TXT   = ["20","50","30","40"]
CNT   = 3
TOTAL = 0
for C in [7,5,4,6]:
    T = TXT[CNT]
    TOTAL = float (T) + C
    print TOTAL
    CNT-=1
```

(e) Find and write the output of the following Python code : *3*

```
class INVENTORY:
    def __init__(self,C=101,N="Pad",Q=100): #constructor
        self.Code=C
        self.IName=N
        self.Qty=int(Q);
    def Procure(self,Q):
        self.Qty = self.Qty + Q
    def Issue(self,Q):
        self.Qty -= Q
    def Status(self):
        print self.Code,":",self.IName,"#",self.Qty
```

```
I1=INVENTORY()

I2=INVENTORY(105,"Thumb Pin",50)

I3=INVENTORY(102,"U Clip")

I1.Procure(25)

I2.Issue(15)

I3.Procure(50)

I1.Status()

I3.Status()

I2.Status()
```

(f)   What are the possible outcome(s) executed from the following code ?
       Also specify the maximum and minimum values that can be
       assigned to the variable N.   *2*

```
import random

NAV  = ["LEFT","FRONT","RIGHT","BACK"];

NUM  = random.randint(1,3)

NAVG = ""

for C in range (NUM,1,-1):

   NAVG = NAVG+NAV[I]

print NAVG
```

(i) BACKRIGHT	(ii) BACKRIGHTFRONT
(iii) BACK	(iv) LEFTFRONTRIGHT

2. (a)   List four characteristics of Object Oriented Programming.   *2*

        (b)   **class Exam:**   *2*

```
   Regno=1

   Marks=75

   def __init__(self,r,m):        #function 1

      self.Regno=r

      self.Marks=m
```

```
        def Assign(self,r,m):            #function 2

            Regno = r

            Marks = m

        def Check(self):                 #function 3

            print self.Regno, self.Marks

            print Regno, Marks
```

(i) In the above class definition, both the functions — function 1 as well as function 2 have similar definition. How are they different in execution ?

(ii) Write statements to execute function 1 and function 2.

(c) Define a class BOX in Python with the following specifications : *4*

Instance Attributes
```
- BoxID      # Numeric value with a default value 101
- Side       # Numeric value with a default value 10
- Area       # Numeric value with a default value 0
```

Methods :
```
- ExecArea() # Method to calculate Area as
             # Side * Side
- NewBox()   # Method to allow user to enter values of
             # BoxID and Side. It should also
             # Call ExecArea Method
- ViewBox()  # Method to display all the Attributes
```

(d) Differentiate between static and dynamic binding in Python ? Give suitable examples of each. *2*

(e) Write two methods in Python using the concept of Function Overloading (Polymorphism) to perform the following operations : *2*

(i) A function having one argument as Radius, to calculate Area of Circle as **3.14*Radius*Radius**.

(ii) A function having two arguments as Base and Height, to calculate Area of right-angled triangle as **0.5*Base* Height**.

3. (a) What will be the status of the following list after the First, Second and Third pass of the bubble sort method used for arranging the following elements in **ascending order** ? *3*

Note : Show the status of all the elements after each pass very clearly underlining the changes.

    52, 42, –10, 60, 90, 20

(b) Write definition of a method **EvenSum(NUMBERS)** to add those values in the list of NUMBERS, which are odd. *3*

(c) Write Addnew(Member) and Remove(Member) methods in Python to Add a new Member and Remove a Member from a list of Members, considering them to act as INSERT and DELETE operations of the data structure Queue. *4*

(d) Write definition of a method MSEARCH(STATES) to display all the state names from a list of STATES, which are starting with alphabet M. *2*

For example :

If the list STATES contains

`["MP","UP","WB","TN","MH","MZ","DL","BH","RJ","HR"]`

The following should get displayed :

MP

MH

MZ

(e) Evaluate the following Postfix notation of expression : *2*

    `4,2,*,22,5,6,+,/,-`

4. (a) Differentiate between file modes **r+** and **rb+** with respect to Python. *1*

(b) Write a method in Python to read lines from a text file MYNOTES.TXT, and display those lines, which are starting with the alphabet 'K'. *2*

(c) Considering the following definition of class FACTORY, write a method in Python to search and display the content in a pickled file FACTORY.DAT, where FCTID is matching with the value '105'. *3*

```
        class Factory :
          def __init__(self,FID,FNAM):
             self.FCTID = FID      # FCTID  Factory ID
             self.FCTNM = FNAM     # FCTNM  Factory Name
             self.PROD  = 1000     # PROD   Production
          def Display(self):
             print self.FCTID,":",self.FCTNM,":", self.PROD
```

SECTION C

[For all the candidates]

5. (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*

DVD

DCODE	DTITLE	DTYPE
F101	Henry Martin	Folk
C102	Dhrupad	Classical
C101	The Planets	Classical
F102	Universal Soldier	Folk
R102	A day in life	Rock

MEMBER

MID	NAME	DCODE	ISSUEDATE
101	AGAM SINGH	R102	2017−11−30
103	ARTH JOSEPH	F102	2016−12−13
102	NISHA HANS	C101	2017−07−24

(i) To display all details from the table MEMBER in descending order of ISSUEDATE.

(ii) To display the DCODE and DTITLE of all Folk Type DVDs from the table DVD.

(iii) To display the DTYPE and number of DVDs in each DTYPE from the table DVD.

(iv) To display all NAME and ISSUEDATE of those members from the table MEMBER who have DVDs issued (i.e., ISSUEDATE) in the year 2017.

(v) SELECT MIN(ISSUEDATE) FROM MEMBER;

(vi) SELECT DISTINCT DTYPE FROM DVD;

(vii) SELECT D.DCODE, NAME, DTITLE

FROM DVD D, MEMBER M WHERE D.DCODE=M.DCODE;

(viii) SELECT DTITLE FROM DVD

WHERE DTYPE NOT IN ("Folk", "Classical");

6. (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*

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

7. (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 friend's 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.
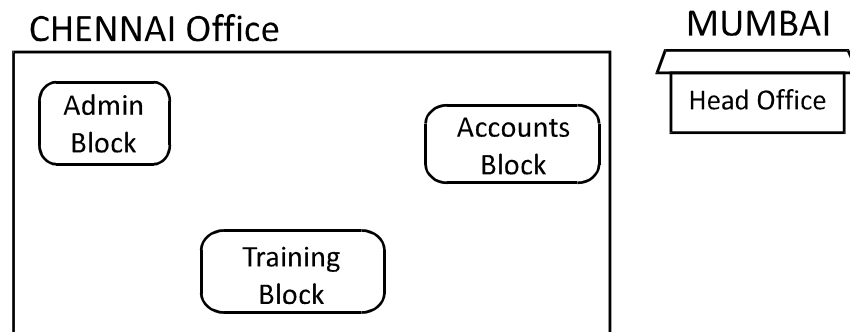
Shortest distances between various blocks/locations :

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*