

- Please check that this question paper contains 8 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) What is polymorphism ? Give an example in C++ to show its implementation in C++. 2
- (b) Write the names of the header files to which the following belong : 2
- (i) `getst()`
  - (ii) `strcmp()`
  - (iii) `abs()`
  - (iv) `isalnum()`
- (c) Rewrite the corrected code for the following program. Underline each correction (if any) 3

```
#include <iostream.h>
structure Supergym
{
    int member number;
    char membername[20];
    char membertype[] = "HIG";
};
void main()
{
    Supergym person1, person.2;
    cin<<"Member Number:";
    cin>>person1.membernumber;
    cout<<"Member Name :";
```

```

    cin>>person1.membername;
    person1.member type = "MIG";
    person2 = person1;
    cin<<"Member Number:"<<person2.membernumber;
    cin<<"Member Name"<<person2.membername;
    cin<<"Member Number:"<<person2.membertype;
}

```

(d) What will be the output of the following program :

2

```

#include<iostream.h>
#include<ctype.h>
#include<conio.h>
#include<string.h>
void ChangeString(char Text[], int &Counter)
{
    char *Ptr = Text;
    int Length = strlen (Text);
    for ( ;Counter<Length-2; Counter+=2, Ptr++)
    {
        * (Ptr + Counter) = toupper( * (Ptr + Counter) );
    }
}
void main()
{
    clrscr();
    int Position = 0;
    char Message[] = "Pointers Fun";
    ChangeString (Message, Position);
    cout<<Message<<" @ "<<Position;
}

```

(e) What will be the output of the following program :

2

```

#include <iostream.h>
void main( )
{
    int var1=5, var2=10;
    for (int i=1; i<=2; i++)
    {
        cout<<var1++<<'\t'<<--var2<<endl;
        cout<<var2--<<'\t'<<++var1<<endl;
    }
}

```

- (f) Write definition for a function SumSequence( ) in C++ with two arguments/parameters — double x and int n. The function should return a value of type double and it should perform sum of the following series : 4

$$1/x - 3!/x^2 + 5!/x^3 - 7!/x^4 + 9!/x^5 - \dots \text{ up to } n \text{ terms}$$

(Note : The symbol ! represents Factorial of a number i.e.

$$5! = 5 \times 4 \times 3 \times 2 \times 1)$$

2. (a) Given the following C++ code, answer the questions (i) & (ii). 2

```
class TestMeOut
{
public:
    ~TestMeOut()          //Function 1
    {cout<<"Leaving the examination hall"<<endl;}

    TestMeOut()          //Function 2
    {cout<<"Appearing for examination"<<endl;}

    void MyWork()        //Function 3
    {cout<<"Attempting Questions"<<endl;}
};
```

- (i) In Object Oriented Programming, what is **Function 1** referred as and when does it get invoked / called ?
- (ii) In Object Oriented Programming, what is **Function 2** referred as and when does it get invoked / called ?
- (b) Declare a class *myfolder* with the following specifications : 4

**private members of the class**

Filenames — an array of strings of size [10] [25]  
(to represent all the names of files inside myfolder)

Availspace — long  
(to represent total number of bytes available in myfolder)

Usedspace — long  
(to represent total number of bytes used in myfolder)

**public members of the class**

Newfileentry( ) - A function to accept values of Filenames, Availspace and Usedspace from user

Retavailspace( ) - a function that returns the value of total Kilobytes available  
(1 Kilobyte = 1024 bytes)

Showfiles( ) - a function that displays the names of all the files in myfolder

(c) Given the following class definitions answer the questions that follow :

4

```
class livingbeing
{
    char specification[20];
    int averageage;
public:
    void read();
    void show();
};
class ape : private livingbeing
{
    int no_of_organisms, no_of_bones;
protected:
    int iq_level;
public:
    void readape();
    void showape();
};
class human : public ape
{
    char race[20];
    char habitation[30];
public:
    void readhuman();
    void showhuman();
};
```

- (i) Name the members, which can be accessed from the member functions of class human.
- (ii) Name the members, which can be accessed by an object of class ape.
- (iii) Name the members, which can be accessed by an object of class human.
- (iv) What will be the size of an object (in bytes) of class human ?

3. (a) Define a function **SwapArray( int [ ], int)**, that would accept a one dimensional integer array NUMBERS and its size N. The function should rearrange the array in such a way that the values of alternate locations of the array are exchanged (Assume the size of the array to be even)

Example :

If the array initially contains

{2, 5, 9, 14, 17, 8, 19, 16},

then after rearrangement the array should contain

{5, 2, 14, 9, 8, 17, 16, 19}

3

- (b) An array ARR[5][5] is stored in the memory with each element occupying 2 bytes of space. Assuming the base address of ARR to be 1500, compute the address of ARR[2][4], when the array is stored : 4
- (i) Row Wise
- (ii) Column Wise
- (c) Write a function in C++ to find the sum of diagonal elements from a 2 dimensional array of type float. Use the array and its size as parameters with float as its return type. 2
- (d) Obtain the postfix notation for the following infix notation of expression showing the contents of the stack and postfix expression formed after each step of conversion : 2

$$A * B + (C - D/F)$$

- (e) Define member functions **queins( )** to insert nodes and **quedel( )** to delete nodes of the linked list implemented class **queue**, where each node has the following structure : 4

```

struct node
{
    char name[20];
    int age;
    node *Link;
};
class queue
{
    node * rear,* front;
public:
    queue(){rear=NULL;front=NULL};
    void queins();
    void quedel();
};

```

4. (a) Assuming that a text file named FIRST.TXT contains some text written into it, write a function named **vowelwords( )**, that reads the file FIRST.TXT and creates a new file named SECOND.TXT, to contain only those **words** from the file FIRST.TXT which start with a lowercase vowel (i.e. with 'a', 'e', 'i', 'o', 'u'). For example if the file FIRST.TXT contains

**Carry umbrella and overcoat when it rains**

Then the file SECOND.TXT shall contain

**umbrella and overcoat it**

3

(b) Assuming the class Computer as follows :

2

```
class computer
{
    char chiptype[10];
    int speed;
public:
    void getdetails()
    {
        gets(chiptype);
        cin>>speed;
    }
    void showdetails()
    {
        cout<<"Chip"<<chiptype<<" Speed= "<<speed;
    }
};
```

Write a function **readfile( )** to read all the records present in an already existing binary file SHIP.DAT and display them on the screen, also count the number of records present in the file.

5. (a) What do you understand by normalization ? What is First Normal Form ?

2

Given the following tables for a database **LIBRARY**

Table : **Books**

Book_Id	Book_Name	Author_Name	Publishers	Price	Type	Quantity
F0001	The Tears	William Hopkins	First Publ.	750	Fiction	10
F0002	Thunderbolts	Anna Roberts	First Publ.	700	Fiction	5
T0001	My First C++	Brian & Brooke	EPB	250	Text	10
T0002	C++ Brainworks	A.W. Rossaine	TDH	325	Text	5
C0001	Fast Cook	Lata Kapoor	EPB	350	Cookery	8

Table : **Issued**

Book_Id	Quantity_Issued
F0001	3
T0001	1
C0001	5

Write SQL queries for (b) to (g) :

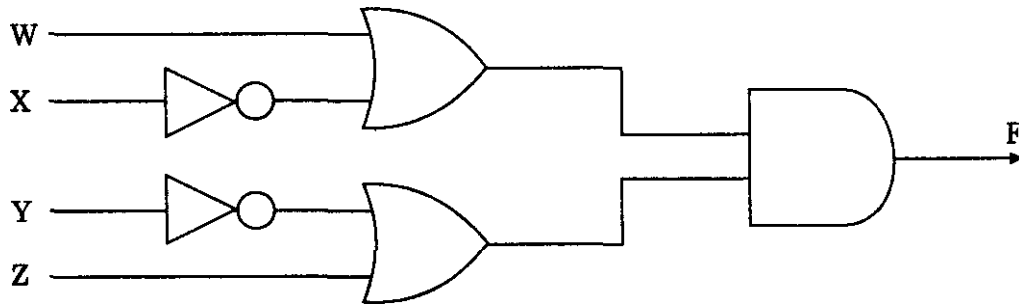
- (b) To show Book name, Author name and Price of books of **EPB** publishers 1
- (c) To list the names of books of **Fiction** Type 1
- (d) To display the names and price of the books in descending order of their price 1
- (e) To increase the price of all books of First Publ. by 50 1
- (f) To display the Book\_Id, Book\_Name and Quantity\_Issued for all books which have been issued. (The query will require contents from both the tables) 1
- (g) To insert a new row in the table **Issued** having the following data : 1  
 "F0002", 4
- (h) Give the output of the following queries based on the above tables : 2
- (i) SELECT COUNT(DISTINCT Publishers) FROM Books
- (ii) SELECT SUM(Price) FROM Books WHERE Quantity >5
- (iii) SELECT Book\_Name, Author\_Name FROM Books WHERE Price <500
- (iv) SELECT COUNT (\*) FROM Books
6. (a) State and prove the absorption law algebraically. 2
- (b) Given the following truth table, derive a sum of product (SOP) and Product of Sum (POS) form of Boolean expression from it : 2

A	B	C	F(A,B,C)
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	1
1	1	1	0

- (c) Obtain a simplified form for the following Boolean Expression using Karnaugh's Map : 3  
 $F(a, b, c, d) = \sum (0, 1, 2, 4, 5, 7, 8, 9, 10, 11, 14)$
- (d) Draw the logic circuit for a Half Adder using NAND gates only. 2

(e) Interpret the following Logic Circuit as Boolean Expression :

1



7. (a) Write two advantages and two disadvantages for STAR topology.

1

(b) Write one difference between coaxial and optical cable.

1

(c) Explain the following terms in short :

2

(i) FTP

(ii) URL

(d) Define Packet Switching.

1