Computer Science (Theory)

Time allowed : 3 hrs.   Maximum Marks : 70

Note: (i) All questions are compulsory. (ii) Programming Language: C++ (iii) Total Pages:10

1. (a) Name the header file to which the following belong :   **1**

    (i) atof()   (ii) strchr()

  (b) How does a class accomplish data abstraction and encapsulation?   **2**

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

```
struct  emp;
{
        int id;
        char name[20];
    private:
        getemp(void);
        showemp(void)
}
main()
{
        do
        {
                cout<<in<<loop;
                counter++;
        }while(1)
}
```

  (d) Find the output of the program.   **3**

```
#include <iostream.h>
#include <string.h>
```

```c
#include <ctype.h>
void funnystr(char *s, int n = 2)
{
        int i = n;

        while(i < strlen(s))
        {
                s[i] = '-';
                i = i + n;
        }
        i = 0;
        while(s[i] != '\0')
        {
                if(s[i] > 'A' && s[i] < 'P')
                        s[i] = tolower(s[i]);
                else if(s[i] > 'a' && s[i] < 'p')
                {
                        if(i % 3 == 0)
                                s[i] = tolower(s[i-1]);
                        else
                                s[i] = tolower(s[i]);
                }
                i++;
        }
}
void main()
{
        char str[] = "MiCroSoFT";
        funnystr(str,3);
        cout<<str;
}
```
(e) Find the output of the following program. **3**

```cpp
#include <iostream.h>
int update1(int b3)
{
        int temp;
        temp = b3 - ( b3%10 + 2)
        return temp;
}
void update2(int s1,int &s2,int s3=40)
{
        if(s1 > s2)
                s1 = s1 - 2;
        else
                s1 = s2 - s1;
        if(s2 > s3)
                s2 = s2 - s3;
        else
                s2 = s3 - s2;
        s3 = update1(s3);
        cout<<s1<<" ; "<<s2<<" ; "<<s3<<endl;
}
void main()
{
        int x,y,z;
        x=100;y=200;z=300;
        update2(x,z,y);
        cout<<x<<" ; "<<y<<" ; "<<z<<endl;
        update2(y,z);
        cout<<x<<" ; "<<y<<" ; "<<z<<endl;
}
```

2. (a) Reusability of classes is one of the major properties of OOP. How is it implemented in C+++? **2**

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

```
class serial
{
        int serialcode;
        char title[20];
        float duration;
        int no_of_episode;
public:
        serial()                    //function 1
        { duration = 30;
          no_of_episode = 10;
        }
        serial(int d, int noe)    //function 2
        { duration = d;
          no_of_episode = noe;
        }
        serial( &s1)              // function3
        { }
        ~serial()                 // function 4
        {
                cout<<"Destroying Object"<<endl;
        }
};
```

(i) Complete definition of function 3

(ii) Give example how function1 and function 2 get executed when object is created.

(c) Define a class Bank to represent the bank account of a customer with the following specification **4**

Private Members:
- Name   of type character array(string)
- Account_no   of type long
- Type_of_account (S for Saving Account, C for current Account) of type char
- Balance   of type float

Public Members:

A constructor to initialize data members as follows

- Name   NULL
- Account_no   100001
- Type_of_account   'S'
- Balance   1000

A function **NewAccount()** to input the values of the data members Name, Account_no, Type_of_account and Balance with following two conditions

- Minimum Balance for Current account is Rs.3000
- Minimum Balance for Saving account is Rs.1000

A function **Deposit()** to deposit money and update the Balance amount.

A function **Withdrawal()** to withdraw money. Money can be withdrawn if minimum balance is as >=1000 for Saving account and >=3000 for Current account.

A function **Display()** which displays the contents of all the data members for a account.

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

```
class livingbeing
{
        char specification[20];
        int averageage;
    public:
        void read();
        void show();
};
class ape : private livingbeing
{
        int no_of_organs, 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 human.

(iii) What will be the size of an object (in bytes) of class human.

(iv)   Name the class(es) that can access read() declared in livingbeing class.

3 (a) Write a function in C++ which accepts an integer 2D array, its size and row number as arguments and display the sum of particular row. **3**

$$\text{If 2D array is } \begin{bmatrix} 1 & 5 & 9 & 13 \\ 2 & 6 & 10 & 14 \\ 3 & 7 & 11 & 15 \\ 4 & 8 & 12 & 16 \end{bmatrix}$$

Row Number is 2

Then 3 + 7 + 11 + 15 = 36   Output is   Sum = 36

(b) An array S[40][30] is stored in the memory along the row with each of the element occupying 2 bytes, find out the memory location for the element S[15][5], if an element S[20][10] is stored at the memory location 5500. **4**

(c) Define functions stackpush(0 to insert nodes and stackpop() to delete nodes, for a linked list implemented stack having the following structure for each node.

```
struct ticket
{
    long ticketno;
    char name[40];
```

```
        ticket *next;
};
class stack
{
        ticket *top;
   public:
        stack() { top = NULL; }
        void stackpush();
        void stackpop();
};
```

(d) Write a user defined function in C++ which intakes one dimensional array and size of array as argument and find sum of elements which are positive. **3**

If 1D array is $10, 2, -3, -4, 5, -16, -17, 23$

Then positive numbers in above array is 10, 2, 5, 23

Sum = 10 + 2 + 5 + 23 = 40

Output is 40

(e) Evaluate the following Postfix expression showing the stack contents. **2**

$2, 4, *, 3, -, 10, 5, +, /$

4 (a) Write a C++ statement that reads 15 bytes from 35th byte onwards from an input stream fil. **1**

(b) Write a function in C++ to count the number of lines present in a "chapter.txt" file. **2**

(c) Given a binary file "AMOUNT.DAT",containing records of the given class outstand type. **3**

```
        class outstand
        {
                int memno;
                int outamt;
            public:
                void getit()
                {    cin>>memno>>outamt;        }
```

```
        void putit()
        {       cout<<memno<<outamt;       }
        int returnamt()
        {       return outamt;          }
    };
```

Write a function in C++ to write objects having outamt more than Rs. 10,000 into CRITICAL.DAT file

5 (a) What is data independence? How is logical data independence different from physical data independence? **2**

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

EMPLOYEE

W_ID	FIRSTNAME	LASTNAME	CITY
102	SAM	TONES	PARIS
105	SARAH	ACKERMAN	NEW YORK
144	MANILA	SENGUPTA	NEW DELHI
210	GEORGE	SMITH	HOWARD
255	MARY	JONES	HUSTON
300	ROBERT	SAMUEL	WASHINGTON
335	HENRY	WILLIAMS	BOSTON
400	RONNY	LEE	NEW YORK
451	PAT	THOMPSON	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).   Display FirstName and City of Employee having salary between 50,000 and 90,000

ii). Display details of Employees who are from "PARIS" city.

iii). Increase the benefits of employee having W_ID = 210 by 500.

iv). Count number of employees whose name starts from character 'S'.

v).   Select MAX(salary) from desig;

vi). Select FirstName from employee, desig

where designation = 'MANAGER' AND employee.W_ID = desig.W_ID;

vii). Select COUNT (DISTINCT designation) from desig;

viii). Select designation, SUM(salary) from desig

Group by designation

Having count (*) > 2;

6 (a) State Involution Law and verify the same using truth table.   **2**

(b) Write the Product of Sum form of the function F(x , y , z), truth table representation of F is given below: **2**

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

(c) Write the equivalent Boolean Expression for the following Logic Circuit.   **2**
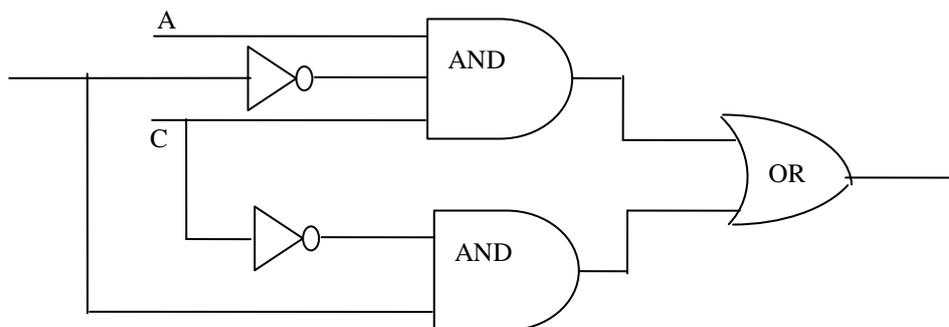
(d) Reduce the following Boolean Expression using K-Map   **2**

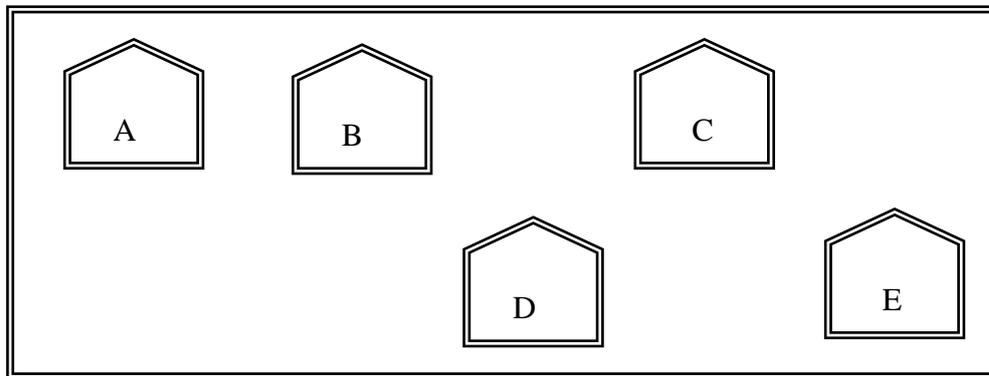F(A,B,C,D) = $\sum$ (0 , 2, 4, 5, 6, 7, 8, 10, 13, 15)

7. (a) Write one advantage and disadvantage of Ring Topology.   **1**

(b) Expand the following terms with respect to Networking.   **2**

   i).   FDM

   ii).   SMS

   iii).   IMAP

   iv).   PPP

(c) Differentiate between HTML and XML?   **1**

(d) Standard Bank has set up its new center in India for its office and web based activities. It has five buildings as shown in the diagram below: **4**

Distance between various buildings	
A to B	50 Mts
B to C	30 Mts
C to D	30 Mts
D to E	35 Mts
E to C	40 Mts
D to A	120 Mts
D to B	45 Mts
E to B	65 Mts

No of computers	
A	55
B	180
C	60
D	55
E	70

  i).   Suggest a possible cable layout for connecting the buildings.   1

 ii).   Suggest the most suitable place to install the server of this organization with a suitable reason.   1

iii).   Suggest the placement of the following devices with justification.   1

        a) Hub/Switch

        b) Modem

 iv)   The company wants to link its head office in 'A' building to its Office in Sydney 1

        a) Which type of transmission medium is appropriate for such a link?

b) What type of network this connection result into?