

COMPUTER SCIENCE – 2001
(Delhi Board)

Time allowed: 3 hours

Max. Marks: 70

Instructions: (i) All the questions are compulsory.
(ii) Programming Language: C++

QUESTION I.

a) Encapsulation is one of the major properties of OOP. How is it implemented in C++?

b) Name the header file to be included for the use of following built-in functions:

(i) frexp() ii) toupper()

c) Identify the syntax error (s), if any (giving reason for error)

```
class ABC
{
    int x = 10;
    float y;
    ABC ()
    { y = 5;}
    ~ABC(){}
};
void main ()
{
    ABC a1,a2;
}
```

d) Give the output of the following program (Assuming all required header files are included in the program) :

```
void main()
{
    int array[]={2,3,4,5};
    int *arptr = array;
    int value = *arptr;
    cout << value << '\n';
    value = *arptr++;
    cout<< value <<'\n';
    value = *arptr;
    cout << value << '\n';
    value = *++arptr;
    cout << value << '\n';
}
```

e) Give the output of the following program

```
# include <iostream.h>
int global = 10;
void func(int &x, int y)
{
    x = x - y;
```

```

        y = x * 10;
        cout << x << << y << '\n';
    }
void main()
{
    int global = 7;
    func (::global, global);
    cout << global <<" " << ::global <<'\n';
    func(global,:: global);
    cout<< global << " " << ::global<<'\n';
}

```

f) Write a function name SUMFUN(), with arguments x and N, which returns the sum of the following series

$$1 - x^2/2 + x^3/3 - x^4/4 + x^5/5 - x^6/6 + \dots + x^N/N$$

QUESTION 2.

a) Illustrate the use of "self referential structures" with the help of an example.

b) Define a class BOOK with the following specifications :

Private members of the class BOOK are

BOOK NO integer type

BOOKTITLE 20 characters

PRICE float (price per copy)

TOTAL_COST() A function to calculate the total cost for N number of copies where N is passed to the function as argument. Public members of the class BOOK are

INPUT() function to read BOOK_NO. BOOK TITLE, PRICE

PURCHASE() function to ask the user to input the number of copies to be purchased. It invokes TOTAL COST 0 and prints the total cost to be paid by the user. Note :

You are also required to give detailed function definitions.

c) Give the output of the following program :

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

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

```
class per
```

```
{
```

```
    char name [20];
```

```
    float age;
```

```
    public:
```

```
        per (char*s, float a)
```

```
        {
```

```
            Strcpy(name, s);
```

```
            age = a;
```

```
        }
```

```
        per &GR (per &x)
```

```

        {
            if (x.age >= age)
                return x;
            else
                return *this;
        }
void display()
{
    cout <<"Name :>> name << '\n';
    cout<< "Age :>> age << '\n';
}
};
void main ()
{
    per P1 ("RAMU", 27.5), P2 ("RAJU", 53), P3("KALU", 40);
    per P ('\0', 0);
    P = P1.GR (P3);
    P.display();
    P = P2.GR (P3);
    P.display();
}

```

QUESTION 3.

a) Given two arrays of integers A and B of sizes M and N respectively. Write a function named MIX () with four arguments, which will produce a third array named C. such that the following sequence is followed.

All even numbers of A from left to right are copied into C from left to right.

All odd numbers of A from left to right are copied into C from right to left.

All even numbers of B from left to right are copied into C from left to right.

All odd numbers of B from left to right are copied into C from right to left. A, B and C are passed as arguments to MIX ().

e.g., A is {3, 2, 1, 7, 6, 3} and B is {9, 3, 5, 6, 2, 8, 10} the resultant array C is {2, 6, 6, 2, 8, 10, 5, 3, 9, 3, 7, 1, 3}

An array X [7] [20] is stored in memory with each element requiring 2 bytes of storage. If the base address of the array is 2000, calculate the location of X[3][5] when the array X is stored in Column major order.

Note: X[7][20] means valid row indices are 0 to 6 and valid column indices are 0 to 19.

(d) Write a user defined function named Upper-half() which takes a two dimensional array A, with size N rows and N columns as argument and prints the upper half of the array. e.g.,

2	3	1	5	0
7	1	5	3	1
2	5	7	8	1
0	1	5	0	1
3	4	9	1	5

The output will be

2	3	1	5	0
	1	5	3	1
		1	7	8
			0	1
				5

d) Convert the expression (True && False) || !(False || True) to postfix expression. Show the contents of the stack at every step.

(e) Each node of a STACK contains the following information, in addition to required pointer field :

- i) Roll number of the student
- ii) Age of the student

Give the structure of node for the linked stack in question TOP is a pointer which points to the topmost node of the STACK. Write the following functions.

- i) PUSH() - To push a node to the stack which is allocated dynamically
- ii) POP() - To remove a node from the stack and release the memory.

QUESTION 4.

a) Distinguish between serial files and sequential files.

b) Consider the class declaration:

```
class BUS
```

```
{
```

```
    int bus_no;
```

```
    char destination[20];
```

```
    float distance;
```

```
    public :
```

```
        void Read(); // To read an object from the keyboard
```

```
        void Write (); // To write an object into a file
```

```
        void Show (); // To display the file contents on The monitor
```

```
};
```

Complete the member functions definitions.

QUESTION 5.

(a) What are DDL and DML ?

(b) Write SQL commands for (i) to (vii) on the basis of the table STUDENT

TABLE : STUDENT

StudentNo.	Class	Name	Game	GGrade	SupW	SGrade
10	7	Sameer	Cricket	B	Photography	A
11	8	Sujit	Tennis	A	Gardening	C
12	7	Kamal	Swimming	B	Photography	B
13	7	Veena	Tennis	C	Cooking	A
14	9	Archna	Basket Ball	A	Literature	A
15	10	Arpit	Cricket	A	Gardening	C

(i) Display the names of the students who are getting grade 'C' in either Game or SupW.

(ii) Display the number of students getting grade 'A' in Cricket.

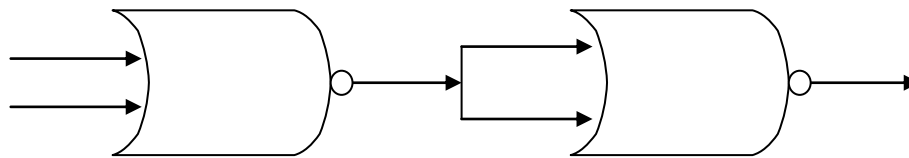
(iii) Display the different games offered in the school.

(iv) Display the SUPW taken up by the students, whose name starts with 'A'.

- (v) Add a new column named 'Marks'.
- (vi) Assign a value 200 for Marks for all those who are getting Grade 'B' or above in Game.
- (vii) Arrange the whole table in the alphabetical order of SUPW.
- (c) If R1 is a relation with 5 rows and R2 is a relation with 3 rows, how many rows will the Cartesian product of R1 and R2 have ?

QUESTION 6.

- (a) State and verify Involution law.
- (d) Prove algebraically : $X.Y + X'.Z + Y.Z = X.Y + X'.Z$
- (c) If $F(a, b, c, d) = \Sigma(0, 2, 4, 5, 7, 8, 10, 12, 13, 15)$, obtain the simplified form using K-Map.
- (d) Represent NOT using only NOR gate(s).
- e) Given the following circuit



What is the output if

- (i) both inputs are False
- (ii) one is False and the other is True
- (f) Draw the circuit of a Half Adder using only NAND gates.

QUESTION 7.

- (a) What are Routers?
- (b) What do you understand by a backbone network?
- (c) Name two switching circuits and explain any one.
- (d) Mention one difference between Circular and Star Topologies in networking.

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