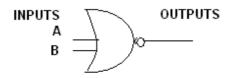
ISC 2009 COMPUTER SCIENCE PAPER 1 THEORY PART I

Answer all questions in this part

Question 1.

- a) Obtain the truth table to verify the following expression: X(Y+Z) = XY + XZ. Also name the law stated above.
- b) Answer the following questions related to the gate given below:



- i) What is the output of the above gate if input A=0, B=1
- ii) What are the values of the inputs if output is 1?
- c) Given $F = A + (B = C) \cdot (D' + E)$. Find F' and show the relevant working in steps.
- d) State the dual for the following expression and also draw the logic gate diagram for the dual expression obtained using NOR gate only.

e) For the given truth table where A,B,C are inputs and X is the output,

Α	В	С	Χ
A 0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Write

- i) Canonical Sum of Product expression
- ii) Canonical Product of Sum expression

 $[2 \times 5 = 10]$

Question 2.

- a) State a difference between linear and non linear data structure. Give one example of each.
- b) Convert the following infix expression to its postfix form:-

$$((P*Q) / (R/S +T)) + U$$

c) Simplify the following expression by using the Boolean laws. Show the working in steps and also mention the laws used.:

$$X'Y'Z' + X'Y'Z + X'YZ + X'YZ' + XY'Z + XY'Z$$

- d) Each element of an array A[20][10] requires 2 bytes of storage. If the address of A[6][8] is 4000, find the base address at A[0][0] when the array is stored row major wise.
- e) Define inheritance. How is it useful in programming?

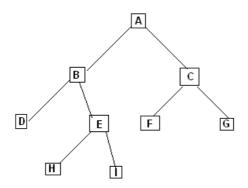
 $[2 \times 5 = 10]$

Question 3.

a) The following function trial() and perform() are a part of some class. Answer the following parts given below. Show the dry run/working.

```
int trial()
{
        if(n==1)
                 return 2;
        else if(n==2)
                 return 3;
        else
                 return trial(n-2) + trial(n-1);
}
void perform(int p)
{
        int x;
        for(int i=1;i<=p;i++)
        {
                 x=trial(i);
                 System.out.print(x+" ");
        }
}
i)
        What will the function trial() return when the value of n is 4?
                                                                                             [2]
                                                                                             [2]
ii)
        What will be the output of the function perform() when the value of p is 5?
iii)
        In one line state what the function trial() is doing, apart from recursion?
                                                                                             [1]
```

b) Answer the following from the diagram of a binary teee given below:



- i) Root of the tree.
- ii) External nodes of the tree.
- iii) List the nodes in the tree using inorder traversal.
- iv) Left subtree
- v) Height of the tree

[1X5 = 5]

Part II Section A

Answer any three questions

Question 4.

a) F(P,Q,R,S) = P'Q'RS' + P'QRS' + PQ'R'S+PQ'RS'+PQ'RS+PQR'S+PQRS'+PQRS'

Use Karnaugh map to reduce the given function F using the SOP form. Draw a logic gate diagram for the reduced SOP form. You may use gates with more than two inputs. Assume that the variables and their complements are available as inputs.

b) $F(A,B,C,D) = \pi(0,1,2,3,5,7,9,13)$

Use Karnaugh map to reduce the given function F using the POS form. Draw a logic gate diagram for the reduced POS form. You may use gates with more than two inputs. Assume that the variables and their complements are available as inputs.

 $[5 \times 2 = 10]$

Question 5.

A provisional store announces a special discount on all its products as a festival offer only to those who satisfy any one of the following conditions:

• If he/she is an employee of the store and has a service of more than ten years

OF

• If he/she is a regular customer of the store whose age is less than 65 years and is not an employee of the store

OR

• If he/she is a senior citizen but not a regular customer of the store

The inputs are:

E : Employee of the store

are available as inputs.

R : Regular customer of the store

S : Service of the employee is more than 10 years

C : Senior citizen of 65 years or above

Output

X : Denotes eligible for discount[1 indicates YES and 0 indicates NO in all cases]

- a) Draw the truth table for the inputs and outputs given above an write the SOP expression for X(E,R,S,C)
- b) Reduce X(E,R,S,C) using Karnaugh's map.
 Draw the logic gate diagram for the reduced SOP expression for X(E,R,S,C) using AND, OR gates
 You may use gates with more than 2 inputs. Assume that the variables and their complements

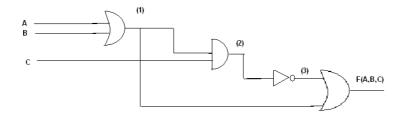
[5 x 2= 10]

Question 6.

- a) Draw a truth table representing a 2 input XNOR gate and derive its SOP expression along with its logic gate diagram. [3]
- b) Simplify the following expression and convert it to its canonical POS form: (X.Y+Z)(Y+Z'.X)

[3]

c) From the logic circuit diagram given below, name the parts (1), (2), (3) and finally derive the Boolean expression and simplify it:



[4]

Question 7.

- a) Prove that the complement of A(A+B).B(B+C') is a universal gate. [2]
- b) Minimise the following expression. At each step state clearly the law used. [3] Y=(A+B').(B+CD)'
- c) Draw the truth table and logic circuit diagram for a decimal to binary encoder. [5]

Question 8.

- a) State a difference between multiplexers and decoders. Also state a use of each. [2]
- b) Verify the following Boolean expression with the help of truth table. [3]

$$A \oplus (B \bigodot C) = A \bigodot (B \oplus C)$$

[5]

c) Write the SOP expression, truth table and the logic circuit of full adder.

Section B

Answer any 4 questions.

Each program should be written in such a way that it clearly depicts the logic of the problem. This can be achieved by using mnemonic names and comments in the program.

(Flowcharts and algorithms are not required)

The programs must be written in C++/Java

Question 9.

A magic number is a number in which the eventual sum of digits of the number is equal to 1. For example, 172 = 1 + 7 + 2 = 10

10 = 1 + 0 = 1

Then 172 is a magic number.

Design a class Magic to check if a given number is a magic number. Some of the members of the class are given below:

Class name : Magic

Data members

n : stores the number

Member functions

Magic() : constructor to assign 0 to n

void getnum(intnn) : to assign the parameter value to the number,

n=nn

int Sum_of_digits(int) : return the sum of the digits of number

void ismagic() : checks if the given number is a magic number

by calling the function Sum_of_digits(int) and

displays appropriate message.

Specify the class Magic by giving details of the constructor, void getnum(int), intSum_of_digits(int) and void ismagic(). You need not write the main function.

[10]

Question 10.

A transpose of an array is obtained by interchanging the elements of rows and columns. A class Transarray contains a two dimensional integer array of order $[m \times n]$. The maximum value possible for both 'm' and 'n' is 20. Design a class Transarray to find the transpose of a given matrix. The details of the members of the class are given below:

Class name : Trasarray

Data members

arr[][] : stores the matrix elements

m : integer to store the number of rows.
n : integer to store the number of columns.

Member functions

Transarray() : default constructor.

Transarray(intmm,intnn) : to inititalize the size of the matrix, m=mm,n=nn.

voidfillarray() : to enter elements into the matrix.
void transpose(Transarray A) : to find the transpose of a given matrix.
voiddisaparray() : displays the array in a matrix form.

Specify the class Transarray giving details of the constructors, void fillarray(), void transpose(Transarray) and void disparray(). You need not write the main function.

[10]

Question 11.

A library issues books on a rental basis at a 2% charge on the cost price of the book per day. As per the rules of the library, a book can be retained for 7 days without any fine. If the book is returned after 7 days, a fine will also be charged for the excess days as per the chart given below:

Number of excess days Fine per day

 1 to 5
 2.00

 6 to 10
 3.00

 Above 10 days
 5.00

Design a class Library and another class Compute to perform the task. The details of the 2 classes are given below:

Class name : Library

Data members

name : name of the book author : author of the book

p : price of the book in decimals

Member functions

Library(...) : parameterized constructor to assign values to data

members.

void show() : display the book details

class name : Compute

Data members

d : number of days taken in returning the book.

f : to store the fine.

Member functions

Compute(...) : parameterized constructor to assign values to data

Members of both classes.

void fine() : calculate the fine for excess days.

void display() : displays the book details along with the number of days,

fine and total amount to be paid. Total amount is calculated as:

(2% of price of book * total no. of days) + fine

Specify the class Library giving details of the constructors and void show(). Using the concept of inheritance, specify the class Compute giving details of the constructor, void fine() and the void display() function. You need not write the main function.

[10]

Question 12.

A class PrimeFac contains an array of 50 integers. Some of the members of the class are given below:

Class name : PrimeFac

Data members

num[] : array to store integers.

freq[] : array to store the frequency of prime factors of

numbers.

Member functions

PrimeFac() : constructor to inititalize array elements to 0.

void enter() : to enter values into array num[]

voidfrefac() : to determine the frequency of prime factors of the

numbers stored in num[] and assign it to freq[].

voiddisp() : to display both the arrays.

Specify the classPrimeFac giving details of the constructor, void enter(), void frefac() and void disp(). You need not write the main function.

[10]

Question 13.

Class Binary contains an array of n integers (n<=100) that are already arranged in ascending order. The subscripts of the array elements vary from 0 to n-1. The data members and member functions of class Binary are given below:

Class name : Binary

Data members

A[] : integer array of 100 elements

n : size of array

I location of the lower bound u : location of the upper bound

Member functions:

Binary(intnn) : constructor to initialize the size n to nn and the

other instance variables.

voidreaddata() : to fill the elements of the array in ascending

order.

intbinary_search(int v) : returns the location of the value(v) to be

searched in the list by binary search method using the recursive technique. The function returns -1 if the number is not present in the

given list.

a) Specify the class Binary giving details of the constructor, void readdata() and intbinary search(int). younedd not write the main function.

[8]

b) State the base case in the recursive technique binary_search().

[1]

c) What are the drawbacks of using the recursive technique.

[1]

Question 14.

A class SortWord has been defined with the following details:

Class name : SortWord

Data members

txt : stores the word.

len : stores the length of the word.

Member functions

SortWord() : default constructor

voidreadTxt() : to accept the word in lower case.

voidsortTxt() : to sort the word in alphabetical order of

characters using bubble sort technique and

display it.

voidchangeTxt() : to change the case of vowels in the word to

upper case. For example :- school becomes

school.

voiddisp() : to display the changed string.

Specify the class SortWord giving the details of the functions constructor, void readTxt(), void sortTxt(), void changeTxt() and void disp(). You need not write the main function.

[10]

Syvum

Worksheet / https://www.syvum.com/cgi/online/serve.cgi/exam/isc/isc_2009_computer_science_practical.html **Test Paper**:

INDIAN SCHOOL CERTIFICATE BOARD EXAMINATION

ISC 2009 Question Paper

COMPUTER SCIENCE

Paper - 2

(PRACTICAL)

(Reading Time: 15 minutes)

(Planning Session AND Examination Session: Three hours)

Show / Hide Top Details

Solve any **one** of the following problems

<

estion 1

Design a program to accept a day number (between 1 and 366), year (in 4 digits) from the user to generate and display the corresponding date. Also accept 'N' (1<=N<=100) from the user to compute and display the future date corresponding to 'N' days after the generated date. Display an error message if the value of the day number, year and N are not within the limit or not according to the condition specified.

Test your program for the following data and some random data.

1. Example:

INPUT:

DAY NUMBER : 233

YEAR : 2008

DATE AFTER (N) : 17

OUTPUT:

20TH AUGUST 2008

DATE AFTER 17 DAYS : 6TH SEPTEMBER 2008

2. Example:

INPUT:

DAY NUMBER 360

YEAR 2008

DATE AFTER (N) 45

OUTPUT:

25TH DECEMBER 2008

DATE AFTER 45 DAYS 8TH FEBRUARY 2009

View Answer(s)

Question 2

Write a program to declare a matrix A[][] of order (m x n) where 'm' is the number of rows and 'n' is the number of columns such that both m and n must be greater than 2 and less than 20. Allow the user to input positive integers into this matrix. Perform the following tasks on the matrix:

- Sort the elements of the outer row and column elements in ascending order using any standard sorting inique and arrange them in an array.
- (D) Calculate the sum of the outer row and column elements.
- (c) Output the original matrix, rearranged matrix and only the boundary elements of the rearranged array with their sum.

Test your program for the following data and some random data.

Example: 1.

INPUT	:	M = 3		
		N = 3		
		1	7	4
		8	2	5
		6	3	9
OUTDIE				

JO

	8	2	5
	6	3	9
UTPUT :			
ORIGINAL N	//ATR	XIX	
	1	7	4
	8	2	5
	6	3	9
REARRANGI	ED N	IATRIX	
	1	3	4
	9	2	5
	8	7	6
BOUNDARY	ELE	MENTS	
	1	3	4
	9		5

3 7

SUM OF THE OUTER ROW AND COLUMN ELEMENTS = 43

2. Example:

INPUT : M = 2

N = 3

7 1 6

8 9 2

OUTPUT :

ORIGINAL MATRIX

7 1 6

8 9 2

REARRANGED MATRIX

1 2 6

9 8 7

BOUNDARY ELEMENTS

1 2

9 8 7

SUM OF THE OUTER ROW AND COLUMN ELEMENTS = 33

6

3. Example:

INPUT : M = 4

N = 4

9 2 1 5 8 13 8 4 15 6 3 11

7 12 23 8

OUTPUT

ORIGINAL MATRIX

9 2 1 5 8 8 13 4 15 6 3 11 8 7 12 23

REARRANGED MATRIX					
	1	2	4	5	
,	23	13	8	7	
	15	6	3	8	
	12	11	9	8	
BOUNDARY E	LEMEN	ΓS			
	1	2	4	5	
2	23			7	
	15			8	
	12	11	9	8	

SUM OF THE OUTER ROW AND COLUMN ELEMENTS = 105

Question 3

Read a single sentence which terminates with a full stop(.). The words are to be separated with a single blank space and are in **lower case**. Arrange the words contained in the sentence according to the length of the words in ascending order. If two words are of the same length then the word occurring first in the input sentence should come first. For both input and output, the sentence must begin in upper case.

Test your program for the following data and some random data.

INPUT: The lines are printed in reverse order.

JTPUT : In the are lines order printed reverse.

INPUT : Print the sentence in ascending order.

OUTPUT : In the print order sentence ascending.

INPUT : I love my country.

OUTPUT : I my love country.

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