Christu Jyoti Convent Senior Secondary School

Pre-Board Examination
Subject - Computer Science
Class – XII

**TIME – 3 hours**   **M.M.-70**

PART I

Answer all questions, while answering questions in this part, indicate briefly your working and reasoning, wherever required.

Question 1   **[10]**

(i)   Identify the universal gates from the following.
a) NAND and NOR gates   b) NOT and XOR gates
c) AND and NOT gates   d) OR and XOR gates

(ii) Choose the correct logic Gates that provide output as 1 when both inputs are the same.

a)XOR   b)AND   c)XNOR   d)OR

(iii) State idempotence law
a)1+p=p   **b)** p+p=p   **c)** p+q=q+p   **d)** p''=p

(iv) The dual of (X+Y').Z.1= X.Z +Y'.Z is……………
a) (X'+Y).Z'.0=X'.Z'+Y.Z'   **b)** (X'.Y)+Z'+0=X'+Z'.Y+Z'
c) (X.Y')+Z+0=(X+Z).(Y'+Z)   **d)** (X'+Y)+Z'.1=X'+Z'.Y+Z'

(v)   Name the logic gate for the following circuit diagram.
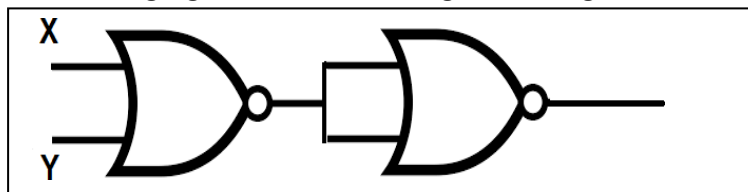
a)NAND   **b)** NOR   **c)** AND   **d)** OR

(vi) B + AB' + AB = ?
a) A+B b)A'+B c)A+B' d)AB'

(vii) Which type of inheritance cannot achieve by class.
a) Single   b) Multi level   c) multiple   d) hierarchical

(viii) What will be the output of the following?
```
class demo
{
  public static void main(String args[])
  {
    byte b=30;
    System.out.println(b*5);
  }
}
```
a) 150   b) -106   c)Syntax Error d) Possible loss of precision error

(ix) What is a linked list?

(x)   What do you mean by auto boxing?

Question 2   **[10]**

a)   State the difference between abstract class and interface

b) A two dimensional array A[3...15, -2....6] is stored in the memory with each element requiring 2 words of storage. If the array is stored in column major order beginning location 150, find the address of A[5, 3].

c) Minimize AB+(AC)**'**+AB**'**C(AB+C).

d) Determine whether (p&q)$^\vee$(~p&q) is satisfiable, contradiction or valid.

e) Write the equivalent postfix expression of given infix expression, **a / (b * c) – d/(e + f * g)**.

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PART – **II**

*Answer **six** questions in this part, choosing **two** questions from Section A,*
***two** from Section B and **two** from Section C.*

**SECTION - A**

*Answer any **two** questions.*

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Question 4

    a) Given **F(A,B,C,D) = Σ (0, 1, 2, 3, 4, 8, 9, 10, 12)**   **[4+1]**
        (i) Reduce the above expression by using 4-variable Karnaugh map, showing the various groups (i.e. octal, quads and pairs).
        (ii) Draw the logic gate diagram for the reduced expression. Assume that the variables and their complements are available as inputs.

    b) Given **F(P,Q,R,S) = π (0, 3, 4, 6, 7, 8, 10, 11, 12, 14, 15)**   **[4+1]**
        (i) Reduce the above expression by using 4-variable Karnaugh map, showing the various groups (i.e. octal, quads and pairs).
        (ii) Draw the logic gate diagram for the reduced expression. Assume that the variables and their complements are available as inputs.

Question 5   **[5+1]**

    a) Implement the following Boolean function with multiplexer. Write its equation also.
        F(A, B, C, D) = Σ(0, 3, 5, 6, 8, 9, 14, 15).

    b) Prove A+A**'**B**'** **=** A + B**'**   **[2]**

    c) Use Boolean algebra to simplify the following logic gate circuit: **[2]**
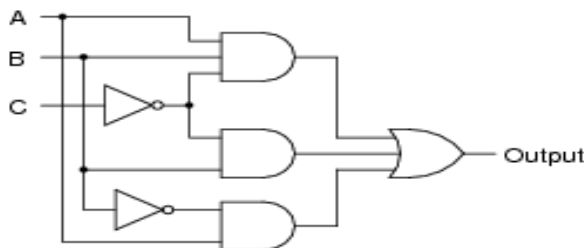
Question 6

    a) What is Encoder? Draw the circuit diagram for decimal to binary encoder.   **[1+4]**

    b) Construct a boolean function of three variables p, q and r that has an output 1 when exactly two of p, q, r are having values 0, and an output 0 in all other case. Construct its logic gate diagram using NAND gate only.   **[2+1]**

    c) If A denotes "I will not go to school" and B denotes "I will watch a movie", then what does
       (i) A**'** + B **(ii)** A**'**=>B**'** stand for?   **[2]**

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SECTION – B

*Answer any **two** 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 Java.

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Question 7   **[10]**
Write a Java program to find the longest consecutive sequence of integers with no primes. The program should accept a number N and print out the largest block of integers between 2 and N with no primes.
Sample Input/Output :
Enter N : 10
There are no primes between 8 and 10 that is 3 consecutive integers.
Enter N : 30
There are no prime between 24 and 28 that is 5 consecutive integers.
Hint : use the Sieve of Eratosthenes.

Question 8.   **[10]**
Design a class Exchange to accept a sentence and interchange the first alphabet with the last alphabet for each word in the sentence, with single letter word remain unchanged. The words in the input sentence are separated by a single blank space and terminated by a full stop.
Example :
Input : It is a warm day.
Output : tl si a marw yad
Some of the data members and member functions are given below :
Cass name : Exchange
Data members / instance variables:
Sent   : to store the sentence
Rev   : to store the new sentence.
Size   : to stores the length of the sentence
Member function :
Exchange( )   : default cottstructor
void readSentence( )   : to accept the sentence
void exfitstlast ( )   : extract each word and interchange the first and last alphabet of the word and form a new sentence rev using the changed words.
void display( )   : display the original sentence along with the new changed sentence.
Specify the class Exchange giving details of the constructor( ), void readSentence( ), void exfitstlast ( ) and void display( ). Define the main( ) function to create an object and call the function accordingly to enable the task.

Question 9.   **[10]**
An emirp number is a number which is prime backwards and forward. Example : 13 and 31 are both prime numbers. Thus, 13 is an emirp number. Design a class **Emirp** to check if a given number is Emirp or not. Some of the numbers of the class are given below:
Class name : Emirp
Data member / instance variables
n   : stores the number.
rev   : stores the reverse of the number.
f   : stores the divisor.
Member functions:
Emirp(int nn)   : to assign n = nn, rev = 0 and f =2
int isPrime(int x)   : check if the number is prime using the recursive technique and return 1 if prime otherwise return 0.
void isEmirp( )   : reverse the given number and check if both the original number and the reverse number are prime, by invoking the function isPrime(int) and display the result with an appropriate message.

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Specify the class Emirp giving details of the constructor( ), void isPrime( ), and void isEmirp(). Define the main function to create an object and call the methods to check for Emirp number.

SECTION – C

*Answer any **two** questions*
Each Program should be written in such a way that it clearly depicts the logic of the problem step wise. This can also be achieved by using comments in the program and mnemonic names or pseudo codes for algorithms. The program must be written in Java and the algorithms must be written in general / standard form, wherever required / specified.
(Flowcharts are **not** required.)

Question 10 **[5]**
Define a class **Queue** with the following details:
Class name: Queue
Data members/instance variables:
que[]: array to hold the integer elements.
size: stores the size of the array.
front: to point to the index of the front.
rear: to point to the index of the rear.
Member functions:
Queue(int m): constructor to initialize the data size the data size = m, front = 0, rear = 0.
void addElement(int v): to add integer from the rear if possible, else display the message "**Overflow**".
int delete(): returns elements from front if present, otherwise displays the message **"Underflow"** and returns -9999.
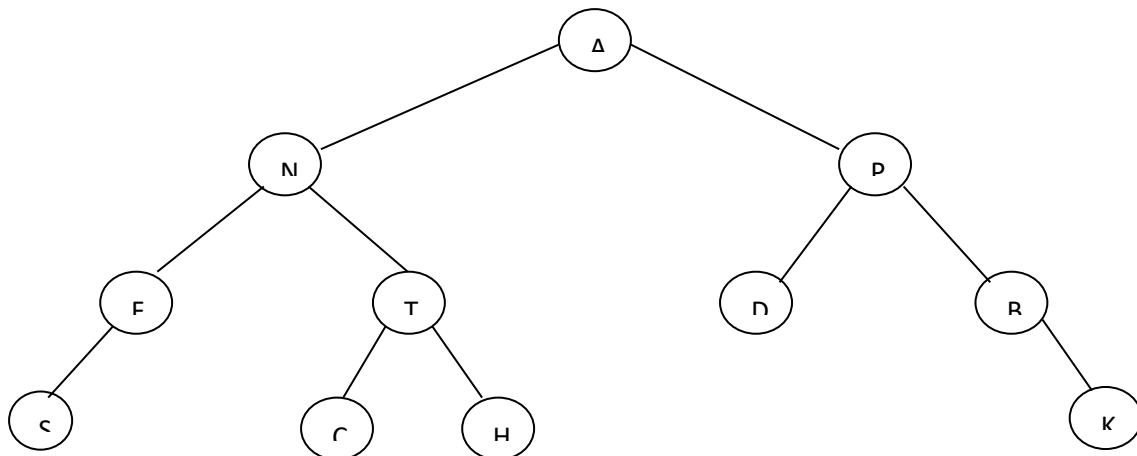void display(): displays the array elements.
Specify the class **Queue** giving details of the constructor, and void **addElement(int)**, **int delete()** and **void display()**. The main function and algorithm need not be written.

Question 11 **[5]**
Answer the given questions from the   diagram of a binary tree given below:

   a) Write the preorder traversal of the above tree structure.
   b) List pairs of siblings.
   c) Write the height of the tree?
   d) What are the leaf nodes?.
   e) Internal nodes of the tree?

Question 12 **[5]**
Write a method or algorithm to search a number in a linked list.