

I TERM EXAMINATION

CLASS: XII

COMPUTER SCIENCE

PAPER 1

(THEORY)

(Maximum Marks: 70)

(Time allowed: Three hours)

*(Candidates are allowed additional 15 minutes for **only** reading the paper.*

*They must **NOT** start writing during this time.)*

Answer **all** questions in Part I (compulsory) and **six** questions from Part-II, choosing **two** questions from Section-A, **two** from Section-B and **two** from Section-C.

All working, including rough work, should be done on the same sheet as the rest of the answer.

The intended marks for questions or parts of questions are given in brackets [].

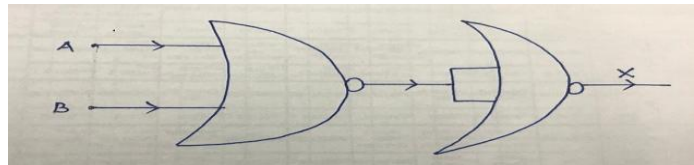
PART I (20 Marks)

Answer **all** questions.

While answering questions in this Part, indicate briefly your working and reasoning, wherever required.

Question 1

- (a) State the properties of zero in Boolean algebra. [1]
- (b) Find the complement of the following Boolean expression using De Morgan's law:
 $F(P, Q, R) = P + (Q' + R)$ [1]
- (c) Find the dual of: $(A' + 0) \cdot (B' + 1) = A'$ [1]
- (d) State whether the following proposition is a tautology, contradiction or a contingency:
 $F = (P \Rightarrow Q) \vee (Q \Rightarrow \sim P)$ [1]
- (e) Study the diagram given below and answer what will be the value of X when A=1 and B=0? [1]



Question 2

- (a) State the difference between *break* and *continue*. [2]
- (b) A matrix B[10][20] is stored in the memory with each element requiring 2 bytes of storage. If the base address at B[2][1] is 2140, find the address of B[5][4] when the matrix is stored in **Column Major Wise**. [2]
- (c) What is Coersion? Explain with the help of an example. [2]
- (d) Why object is known as an instance of a class? Give suitable example. [2]
- (e) What is the significance of the keyword '**new**' in Java? Mention the areas where it is used. [2]

Question 3

The following function **check()** is a part of some class. What will the function check() return when the value of (i) **n=25** and (ii) **n=10**. Show the dry run/ working. [5]

```
int check(int n)
{
    if(n<=1)
        return 1;
    if( n%2==0)
        return 1 + check(n/2);
}
```

```

else
    return 1 + check(n/2 + 1);
}

```

PART – II (50 Marks)

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.

Question 4

(a) Given the Boolean function: $F(A,B,C,D) = \sum (0, 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13,14)$.

(i) Reduce the above expression by using 4-variable Karnaugh map, showing the various groups (i.e. octal, quads and pairs). [4]

(ii) Draw the logic gate diagram for the reduced expression. Assume that the variables and their complements are available as inputs. [1]

(b) Given the Boolean function: $F(A, B, C, D) = \prod (3, 4, 6, 9, 11, 12, 13, 14, 15)$.

(i) Reduce the above expression by using 4-variable Karnaugh map, showing the various groups (i.e. octal, quads and pairs). [4]

(ii) Draw the logic gate diagram for the reduced expression. Assume that the variables and their complements are available as inputs. [1]

Question 5

(a) Draw the logic circuit diagram for an octal to binary encoder and explain its working when a particular digit is pressed. Also, state the difference between *encoders* and *decoders*. [5]

(b) Draw the circuit of a two input XOR gate with the help of NOR gates. [3]

(c) Convert the following expression to its cardinal SOP form:

$$F(P,Q,R) = P'Q'R + P'QR + PQ'R' + PQR' \quad [2]$$

Question 6

A company intends to develop a device to show the high status power load for a household inverter depending on the criteria given below: [10]

- If Air conditioner and Geysers are on
OR
- If Air conditioner is off, but Geysers and Refrigerator are on
OR
- If Geysers is off, but Air conditioner and Water purifier are on
OR
- When all are on

The inputs are:

INPUTS:

A	A Air conditioner is on
G	G Geysers is on
R	R Refrigerator is on
W	W Water purifier is on

(In all the above cases 1 indicates yes and 0 indicates no.)

OUTPUT: X [1 indicates high power, 0 indicates low power for all cases]

Draw the truth table for the inputs and outputs given above and write the **SOP** expression for **X(A,G,R,W)**. Also draw the logic circuit for simplified expression.

Class name : **Mix**
Data member/instance variable:
wrđ : to store a word
len : to store the length of the word

Member functions/methods:

Mix() : default constructor to initialize the data members with legal initial values
void feedword() : to accept the word in UPPER case
void mix_word(Mix P, Mix Q) : mixes the words of objects P and Q as stated above and stores the resultant word in the current object
void display() : displays the word

Specify the class **Mix** giving the details of the **constructor()**, **void feedword()**, **void mix_word(Mix, Mix)** and **void display()**. Define the **main()** function to create objects and call the functions accordingly to enable the task.

SECTION - C

Answer **any two** questions.

Each program should be written in such a way that it clearly depicts the logic of the problem stepwise.

*This can be achieved by using comments in the program and mnemonic names or pseudo codes for algorithms. The programs 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]

Write a program to input two numbers and check whether the numbers are **Twin Prime**.

Twin Prime numbers are the Prime Numbers whose difference is two(2). **For e.g.** (5,7), (11,13), (17,19)

Question 11

[5]

Write a program to accept a number from the user and check it is an **Automorphic Number**.

Automorphic number is the number, which is contained in the last digit(s) of its square. **For e.g.** 25 is an automorphic number as its square is 625 and 25 is present as the last two digits.

Question 12

[5]

Write a program to input a string and print the **Piglatin string**.

A string is said to be in Piglatin form when it is obtained by forming a new word by placing the fore vowel of the original word at the start of the new word along with the letters following it. The letters present before the first vowel are shifted to the end of the new word, followed by 'ay'.