

Class: XI
Subject: Computer Science

Full Marks: 70
Time: 3 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 seven questions from Part-II, choosing **three** 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 M)

Answer **all** questions

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

Question 1

(i) Associative Law states that: [1]

(a) $X + Y = Y + X$

(b) $X + (Y + Z) = (X + Y) + Z$

(c) $X(Y + Z) = XY + XZ$

(d) $X + XY = X$

(ii) The ASCII value of 'P' is: [1]

(a) 4F

(b) 50

(c) 51

(d) 56

(iii) In propositional logic the conditional symbol is: [1]

(a) $\leq$

(b) $\wedge$

(c) $+$

(d) $\supset$

(iv) Study the given propositions and the statements marked Assertion and Reason that follow it. Choose the correct option on the basis of your analysis. [1]

p = It is month of January.

q = It is hot weather.

s1 = $p \rightarrow \sim q$

s2 = $q \rightarrow \sim p$

Assertion: s2 is contrapositive of s1

Reason: The weather is hot that's why the month is not January.

(a) Both Assertion and Reason are true and Reason is the correct explanation for Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation for Assertion.

(c) Assertion is true and Reason is false.

(d) Assertion is false and Reason is true.

(v) If $A=1$ and $B=0$, then find $F=(A' + 1) B$ is: [1]

(a) 1 (b) 0 (c) Inappropriate data (d) Infinite

(vi) If $X \Rightarrow \sim Y$ then, its inverse will be. [1]

(a) $X \Rightarrow Y$ (b) $Y \Rightarrow X$ (c) $\sim X \Rightarrow Y$ (d) $\sim Y \Rightarrow X$

(vii) Given below are two statements makes Assertion and Reason. Read the two statements carefully and choose the correct option. [1]

Assertion: In Boolean algebra, the AND operation is distributive over the OR operation.

Reason: The distributive property states that $A \text{ AND } (B \text{ OR } C)$ is equivalent to $(A \text{ AND } B) \text{ OR } (A \text{ AND } C)$, where A, B, and C are logical variables.

(a) Both Assertion and Reason are true, and the Reason is the correct explanation of the Assertion.

(b) Both Assertion and Reason are true, but the Reason is not the correct explanation of the Assertion.

(c) Assertion is true, but the Reason is false.

(d) Assertion is false, but the Reason is true.

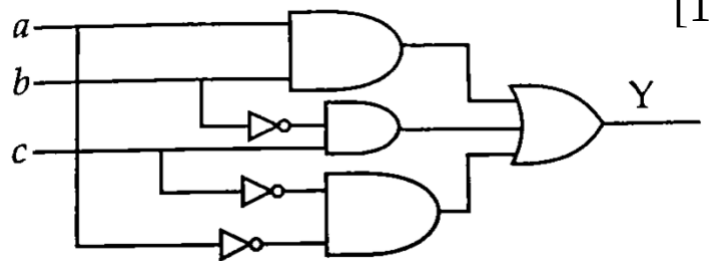
(viii) The equivalent expression for the below given logic circuit is: [1]

(a) $Y = ab + \bar{b}c + \bar{c}\bar{a}$

(b) $Y = \bar{a}b + \bar{b}c + \bar{c}\bar{a}$

(c) $Y = (a+b)(\bar{b}+c)(\bar{c}+\bar{a})$

(d) Y= None of the above



(ix) What is **this** key word? [1]

(x) For draw a full adder circuit. State the names along with the quantity of those gates. [1]

Question 2

(i) Convert the following arithmetic expression into java statement.

$$x = \sqrt{\frac{(p+q)^n}{|4x-2y|}} \quad [2]$$

(ii) Draw the logic circuits for the following. [2]

$$(A+B).(B+\bar{C}).(C+\bar{A})$$

(iii) With reference to the code given below, answer the questions that follow along with dry run/working.

```
boolean num(int x)
{
    int a = 1;
    for (int c = x; c > 0; c/= 10)
        a *= 10;
    return (x * x % a) == x;
}
```

(a) What will the function num() return when the value of x = 25?

[2]

(b) What is the method num() performing?

[1]

(iv) With reference to the code given below answer the questions that follow :

```
void Solve(int n)
{
    int a = 1, b = 1;
    for (int i = n; i > 0; i = 1/10)
    {
        if (d % 2 == 0)
            int d = i % 10;
            a = a * d;
            b = b * d;
        else
            System.out.println(a+", "+b);
    }
}
```

- (a) What will the function Solve() return when the value of $n = 3269$? [2]
(b) What is the method Solve() computing? [1]

PART II (50 M)

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 3.

Perform the following conversion / operations:

- (i) $(101001)_2 - (10111)_2 = (?)_2$ [2]
(ii) $(D769)_{16} + (A9C3)_{16} = (?)_{16}$ [2]
(iii) Encode the following message in ASCII code using the Hex representation “EWMS WB203” [2]
(iv) $(786)_8 - (567)_8 = (?)_8$ using 8’s Complement [2]
(v) $(1011101.101)_2 = (?)_{10}$ [2]

Question 4.

- (a) The Principal of a school intends to select students for admission to class XI on the following criteria:

◆ Student is of the same school and has passed the class X Board Examination with more than 60% marks.

Or

◆ Student is of the same school and has passed the class X Board Examination with more than 60% mark but has taken active part in co-curricular activities.

Or

◆ Student is not from the same school but has either passed the class X board examination with more than 60% marks or has participated in sports at the National Level.

The Inputs are:

Inputs	
S	Student of the same school
P	Has passed the class X Board Examination with more than 60% marks.
C	Has taken active part in co-curricular activities.
T	Has participated in sports at the National Level.

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

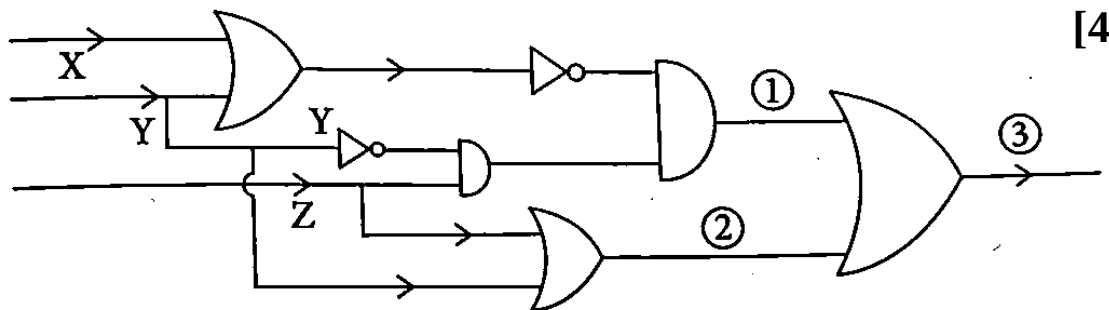
Draw the truth table for the inputs and outputs given above and write **SOP** the expression for X(E, R, S, C). [5]

(b) Difference between Half Adder and Full Adder. Write the truth table of Full Adder. [3]

(c) State and prove De Morgan's law with truth table. [2]

Question 5.

(a) From the logic circuit diagram given below, name the outputs (1), (2) and (3). Finally derive the Boolean expression and simplify it to show that it represents a logic gate. Name and draw the logic gate. [4]



(b) Draw all the basic gates using only NAND gate. [3]

(c) Establish the following using two table: [3]

$$(\sim a + b) \wedge (\sim b + a) = (a \Leftrightarrow b)$$

SECTION B

Answer **any two** questions

Question 6.

[10]

A class Numbers contains the following data members and member functions to check for triangular numbers. [A triangular number is formed by the addition of a consecutive sequence of integers starting from 1].

For example, $1+2=3$; $1 + 2 + 3 = 6$; $1 + 2 + 3 + 4 = 10$;
 $1 + 2 + 3 + 4 + 5 = 15$

Therefore, 3, 6, 10, 15 etc. are triangular numbers.

Class name: Numbers

Data members / instance variables:

n: integers to be checked for whether it is triangular or not

Member function / methods:

Numbers (): Default constructor

void getnum() : to accept integer n

int check(int p) : to check if 'p' is triangular or not. If triangular then return 1 otherwise return 0;

void dispnum() : to display message whether 'n' is triangular or not by invoking the method check function.

Specify the class Numbers giving details of the functions void getnum(), int check(int) and void dispnum(). The main function need not be written.

Question 7.

[10]

A class Adder has been defined to add any two accepted time.

Example: Time A - 6 hours 35 minutes

Time B - 7 hours 45 minutes

Their sum is 14 hours 20 minutes (where 60 minutes = 1 hour)

The details of the members of the class are given below:

Class name: Adder

Data member/instance variable:

A[] : Integer array to hold two elements (hours and minutes)

B[] : Integer array to hold two elements (hours and minutes)

Sum[] : Integer array to hold two elements (hours and minutes) after adding times

Member Functions/methods:

Adder (): constructor to assign 0 to the array elements

void readtime (): to enter the elements of the array

void addtime (int X[], int Y[]): adds the time of the two parameterized variable X and Y and stores the sum in the current calling objects

void disptime():displays the time after adding them with an appropriate message (i.e., hours = and minutes =)

Specifies the class Adder giving details of the constructor (), void readtime(), void addtime(int, int) and void disptime(). Define the main() function to create objects and call the functions accordingly to enable the task.

Question 8.

[10]

Design a class VowelWord to accept a sentence and calculate the frequency of words that begin with a vowel. The words in the input string are separated by a single blank space and terminated by a full stop. The description of the class is given below:

Class name: Vowel Word

Data members/ instance variables:

Str: to store a sentence

Freq: store the frequency of the words beginning with a vowel

Member functions:

VowelWord(): constructor to initialize data members to legal initial value.

void readstr(): to accept a sentence

void freq_vowel(): counts the frequency of the words that begin with a vowel.

void displa(): to display the original string and the frequency of the words that begin with a vowel.

Specify the class Vowel Word giving details of the constructor(), void readstr(), void freq_vowel() and void display(). Also define the main() function to create in object and call the methods accordingly to enable the task.

SECTION C

Answer **any two** questions

Question 9

- a) Write a method to check value of 'n' present in array 'AR[]' or not Using Liner Search. [4]

The method declaration is as follows:

int fnCheck(int AR[], int n)

- b) Why Binary Search required Sorted array? [1]

Question 10

- a) Write a method to calculate and return the power 'm' of a number 'n' (n^m) without using **Math.pow**. [4]

The method declaration is as follows:

int fnPow(int n, int m)

- b) Write 2 advantages of using function in a programme. [1]

Question 11

- a) Write a method to calculate and return the no of digits present in a string. [4]

The method declaration is as follows:

int fnCount(String n)

- b) Write the differences between equals() and compareTo(). [1]