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.)

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*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) Draw the truth table to represent a two input XOR gate. **[1]**

(b) Verify if, (~P V P) Λ 1 = 1 **[1]**

(c) Differentiate between ASCII code and UNICODE. **[1]**

(d) Minimize: F = PQ + (PR)′ +PQ′R using Boolean laws. **[1]**

(e) If A denotes "it is cloudy" and B denotes "it will rain", then express the following statements in symbolic form: **[1]**

(i) If it does not rain then it is not cloudy

(ii) If it is raining then it is cloudy

Question 2

(a) Define 'Base' of number system? Give *one* example. **[2]**

(b) Convert the following arithmetic expression into Java statement **[2]**

$$x = (a^5 + b^7)/ \sqrt{ab}$$

(c) Define the term '*wff*' in propositional logic. Give *one* example. **[2]**

(d) Name the File Stream Class to perform the following operations: **[2]**

(i) to write data into a binary file

(ii) to read data from a text file

(e) Differentiate between *static variable* and *non static variable*. **[2]**

Question 3

The following is a method/function of some class. Give the output of the function **perform( )** when the value of '**n**' is **6579**. Show the dry run/ working. **[5]**

```
void perform( int n )
{
        int s=0, g;
        while( n>0)
        {
           if (n%2==1)
           n/=10;
           g=n%10;
           System.out.print("\n g = \t" + g);
           s=s+g;
           n/= 5;
        }
        System.out.print("\n s = \t" + s);
}
```

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

Perform the following conversions / operations:

(i) $(10110.101)_2 = (\ ?\ )_8$ **[2]**

(ii) $(473)_8 = (\ ?\ )_2$ **[2]**

(iii) $(111011.11)_2 = (\ ?\ )_{16}$ **[2]**

(iv) 1101 – 11 (using 1's complement) **[2]**

(v) 1101 x 111 **[2]**

Question 5

(a) The Planning Committee of a particular town consists of a President, Secretary and a Treasurer. Any decision taken on development plans of the town can be implemented only if : **[5]**

- The President and either Secretary or Treasurer agrees

OR

- All three agree

The inputs are:

INPUTS	
P	Denotes the President's vote
S	Denotes the Secretary's vote
T	Denotes the Treasurer's vote

Output: **X** - Denotes development plan [1 indicates agreed and 0 indicates refused in all cases]

Draw the truth table for the inputs and outputs. Also, write the Boolean expression with conjunctive operators for each of the **true** values (1's) from the output column of the truth table.

(b) Prove the following Boolean expression with the help of a truth table: **[3]**

$A \oplus B = (A \square B)'$

(c) What are *Universal gates?* Draw the AND gate using universal gate. **[2]**

Question 6

(a) Define *Half Adder*. Write the expression and draw the logic diagram for a half adder. **[5]**

(b) Verify if: (a => b) ∨ (b => a) = 1 **[3]**

(c) Draw the logic circuit for the following Boolean expression: **[2]**

$X = (A' + B) . (C + D')$

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.

Question 7

Design a class **WordWise** to separate words from a sentence and find the frequency of the vowels in each word. **[10]**

Some of the members of the class are given below:

Class name	:	**WordWise**
Data members/instance variables:		
str	:	to store a sentence
Member functions/methods:		
WordWise( )	:	default constructor
void readsent( )	:	to accept a sentence
int freq_vowel(String w)	:	returns the frequency of vowels in the parameterized string w
void arrange( )	:	displays each word of the sentence in a separate line along with the frequency of vowels for each word by invoking the function freq_vowel( )

Define the class **WordWise** giving details of the **constructor( ), void readsent(), int freq_vowel(String)** and **void arrange()**. Define the **main( )** function to create an object and call the functions accordingly to enable the task.

Question 8

Design a class **PrimePalinGen** to generate prime palindrome numbers. [A number is said to be prime palindrome if the number is a prime as well as a palindrome number] **[10]**

[Prime number: A number having only two factors i.e. 1 and itself]

[Palindrome number: A number which is same as its reverse]

Example: 11(where 11 is a prime number and a palindrome number)

Some of the members of the class are given below:

Class name	:	**PrimePalinGen**
Data members/instance variables:		
start	:	to store the start of range
end	:	to store the end of range
Methods/Member functions:		
PrimePalinGen (int a, int b)	:	parameterized constructor to initialize the data members start=a and end=b
int isPrime(int i)	:	returns 1 if the number is prime otherwise returns 0
int isPalin(int i)	:	returns 1 if the number is a palindrome otherwise returns 0
void generate( )	:	generates all prime palindrome numbers between start and end by invoking the functions isPrime() and isPalin().

Specify the class **PrimePalinGen** giving details of the **constructor( ),int isPrime(int), int isPalin(int)** and **void generate( ).** Define a **main( )** function to create an object and call the functions accordingly to enable the task.

Question 9

A class **ArrayMax** contains a square matrix which finds the largest element in each row. **[10]**

Some of the members of the class are given below:

Class name	:	**ArrayMax**
Data member/instance variable:		
arr[ ][ ]	:	array to store integer elements
m	:	to store the order of the matrix
Member functions/methods:		
ArrayMax(int mm)	:	parameterized constructor to initialize the data member m=mm and to declare the array
void readarray()	:	to accept the array elements
void large( )	:	finds and displays the largest element in each row with an appropriate message
void display()	:	displays the array elements in matrix form

Specify the class **ArrayMax**, giving the details of the **constructor( )**, **void readarray( )**, **void large( )** and **void display( )**. Define the **main( )** function to create an object and call the functions accordingly to enable the task.

SECTION – C

*Answer **any two** questions.*

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

(Flowcharts and Algorithms are **not** required.)

The methods must be written in Java.

Question 10

(a) Write a *Method* to calculate and return the sum of the square of the digits of a number 'n' using **recursive technique**. **[4]**

The method declaration is as follows:

int sumSq(int n)

(b) State *any one* difference between *recursion* and *iteration*. **[1]**

Question 11

(a) A binary file named "ABC.DAT" contains the product code (pc), unit price (up) and quantity(q) for number of items. **[4]**

Write a *Method* to accept a product code 'p' and check the availability of the product and display with an appropriate message.

The method declaration is as follows:

void findpro(int p)

(b) State *any one* difference between *binary file* and *text file*. **[1]**

Question 12

Answer the following questions given below:

(i) Name the package which is imported by default. **[1]**

(ii) Which statement comes automatically in each class of a user defined package? **[1]**

(iii) What is prolog in artificial intelligence? **[1]**

(iv) What is *infringement?* **[1]**

(v) What is *public domain software?* **[1]**