COMPUTER SCIENCE
PAPER – 2
PRACTICALS

(Maximum Marks: 30)

Time allowed: Three Hours

(Candidates are allowed additional 15 minutes for only reading the paper.
They must NOT start writing during this time.)

The total time to be spent on the Planning Session and the Examination Session is Three hours.
After completing the Planning Session, the candidate may begin the Examination Session.
A maximum of 90 minutes is permitted for the Planning Session.
However, if candidates finish earlier, they are to be permitted to begin the Examination Session.

*This paper consists of **three** problems from which candidates are required to attempt **any one** problem.*

Candidates are expected to do the following:

A. Planning Session:

1.Write an **algorithm** for the selected problem.
(Algorithm should be expressed clearly using any standard scheme such as pseudo code or in steps which are simple enough to be obviously computable.) **[3marks]**

2. Write a **program** in **JAVA** language. The program should follow the algorithm and should be logically and syntactically correct. Document the program using **mnemonic names / comments**, identifying and clearly describing the choice of data types and meaning of variables. **[7marks]**

B. Examination Session:

1. Code / Type the **program** on the computer and get a **printout** (hard copy). Typically, this should be a program that compiles and runs correctly. **[2marks]**

2. Test run the program on the computer using the given sample data and get a **printout of the output** in the format specified in the problem. **[3marks]**

Solve any one of the following problems.

Question 1

A **distinct-prime-digit** integer is a positive integer (without leading zeros) in which all digits are prime numbers and no digit is repeated. The prime digits are 2, 3, 5, 7. For example, 2, 37, 253 are distinct-prime-digits integers, whereas 33, 252, 29 are not.

Given two positive integers m and n (**where m<n**), write a program to determine how many distinct-prime-digit integers are there in the range between m and n (both inclusive) and output them.

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

Example 1

Input : m=20, n=60

Output : The Distinct Prime-digit integers are : 23, 25 ,27, 32, 35, 37, 52, 53, 57
Frequency of Distinct Prime-digit integers is : 9

Example 2

Input : m=70, n=120

Output : The Distinct Prime-digit integers are : 72, 73, 75, 77
Frequency of Distinct Prime-digit integers is : 4

Example 3

Input : m=100, n=180

Output : The Distinct Prime-digit integers are : nil
Frequency of Distinct Prime-digit integers is : 0

Example 4

Input : m=200, n=150

Output : Invalid Input

Question 2

Write a program to declare a **matrix A[ ][ ]** of order (MxN) , 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 6 . Allow the user to input positive integers into this matrix . Display appropriate error message for an invalid input.

Perform the following tasks on the matrix :

a. **Enter the size** of the matrix in 'M' and 'N',check for **validity** (an appropriate error message must be displayed if invalid), **enter elements** into this matrix and **display** the original matrix.
b. Compute and display the **sum of prime elements for each row**.
c. Identify and display the **row index** with **maximum prime-sum** (Print both index and sum; if no primes found in all, print a message).
d. Find the **sum** of the elements of the **four corners** of the matrix.

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

Example 1 **Input** : Enter the size of matrix M=3, N=4
Array elements : 4, 5, 6, 7, 8, 11, 10, 13, 1, 2, 3, 4

Output:

				Prime Sum	
Original matrix:	4	5	6	7	= 12
	8	11	10	13	= 24
	1	2	3	4	= 5 Row with max prime sum : 1 (Sum =24)

Sum of four corner elements = 16

Example 2 **Input** : Enter the size of matrix M=3, N=3

Array elements : 2, 6, 4, 11, 5, 9, 12, 7, 13

Output:

				Prime Sum	
Original matrix:	2	6	4	= 2	
	11	5	9	= 16	
	12	7	13	= 20	Row with max prime sum : 2 (Sum =20)

Sum of four corner elements = 31

Example 3 **Input** : Enter the size of matrix M=2, N=3

Output: Invalid input

Question 3

Write a program to accept a sentence which may be terminated either with a **'.' or '?' or '!'** only. The words may be separated with a **single blank space** and should be case-insensitive.

Perform the following tasks :-

a. **Accept** a sentence in lowercase. An appropriate **error message** must be displayed if it is not terminated with the above given characters. **Display** the original sentence.
b. Display the sentence in **Title case** (the first letter of each word in Uppercase)
c. Check if the sentence is a Palindrome Sentence or not. (A sentence is a palindrome sentence if, after removing spaces and punctuation, the letters read the same forward and backward)
d. Display the first occurring most frequent word in the sentence . if there is a tie, choose the word that appears first in the sentence and if no words are repeated then print NONE.

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

Example 1

Input : no lemon no melon.

Output : Original sentence: no lemon no melon.
Sentence in Title case: No Lemon No Melon.
It is a Palindrome sentence .
Most frequent word : no

Example 2

Input : it is a rainy day!

Output : Original sentence: it is a rainy day!
Sentence in Title case: It Is A Rainy Day!
It is not a Palindrome sentence .
Most frequent word : NONE

Example 3

Input : always be careful#

Output : Invalid input
