COMPUTER SCIENCE

Paper – 2

(PRACTICAL)

(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.

Planning session: 90 minutes

Examination session : 90 minutes

Note: Candidates are to be permitted to proceed to the Examination Session only after 90 minutes of the Planning session are over.

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

Candidates are expected to do the following:

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

2. Write a program in **JAVA** language. The program should follow the algorithm and should be logically and syntactically correct. **[5]**

3. Document the program using mnemonic names / comments, identifying and clearly describing the choice of data types and meaning of variables. **[2]**

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

5. 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. **[5]**

6. Viva-Voce on the **Selected Problem**. **[3]**

In addition to the above, the practical file of the candidate containing the practical work related to programming assignments done during the year is to be evaluated as follows:

- Programming assignments done throughout the year (by the teacher) **[5]**
- Programming assignments done throughout the year (by the Visiting Examiner) **[5]**

This Paper consists of 5 printed pages and 1 blank page.

*Solve **any one** of the following Problems.*

Question 1

A **Circular Prime** is a prime number that remains prime under cyclic shifts of its digits. When the leftmost digit is removed and replaced at the end of the remaining string of digits, the generated number is still prime. The process is repeated until the original number is reached again.
A number is said to be prime if it has only two factors 1 and itself.

Example: 131
311
113

Hence, 131 is a circular prime.

Accept a positive number N and check whether it is a circular prime or not. The new numbers formed after the shifting of the digits should also be displayed.

Test your program with the following data and some random data:

Example 1

INPUT: N = 197

OUTPUT: 197
971
719

197 IS A CIRCULAR PRIME

Example 2

INPUT: N = 1193

OUTPUT: 1193
1931
9311
3119

1193 IS A CIRCULAR PRIME

Example 3

INPUT: N = 29

OUTPUT: 29
92

29 IS NOT A CIRCULAR PRIME

Question 2

Write a program to declare a square matrix A[ ] [ ] of order $(M \times M)$ where 'M' must be greater than 3 and less than 10. Allow the user to input positive integers into this matrix. Perform the following tasks on the matrix:

(a) Sort the non-boundary elements in ascending order using any standard sorting technique and rearrange them in the matrix.

(b) Calculate the sum of both the diagonals.

(c) Display the original matrix, rearranged matrix and only the diagonal elements of the rearranged matrix with their sum.

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

Example 1

INPUT: M = 4

9	2	1	5
8	13	8	4
15	6	3	11
7	12	23	8

OUTPUT:

ORIGINAL MATRIX

9	2	1	5
8	13	8	4
15	6	3	11
7	12	23	8

REARRANGED MATRIX

9	2	1	5
8	3	6	4
15	8	13	11
7	12	23	8

DIAGONAL ELEMENTS

9			5
	3	6	
	8	13	
7			8

SUM OF THE DIAGONAL ELEMENTS = 59

Example 2

INPUT: M = 5

7	4	1	9	5
8	2	6	10	19
13	1	3	5	1
10	0	5	12	16
1	8	17	6	8

OUTPUT:

ORIGINAL MATRIX

7	4	1	9	5
8	2	6	10	19
13	1	3	5	1
10	0	5	12	16
1	8	17	6	8

REARRANGED MATRIX

7	4	1	9	5
8	0	1	2	19
13	3	5	5	1
10	6	10	12	16
1	8	17	6	8

DIAGONAL ELEMENTS

7				5
	0		2	
		5		
	6		12	
1				8

SUM OF THE DIAGONAL ELEMENTS = 46

Example 3

INPUT: M = 3

OUTPUT: THE MATRIX SIZE IS OUT OF RANGE.

Question 3

Write a program to accept a sentence which may be terminated by either '.' , '?' or '!' only. The words may be separated by more than one blank space and are in UPPER CASE.

Perform the following tasks:

(a) Find the number of words beginning and ending with a vowel.

(b) Place the words which begin and end with a vowel at the beginning, followed by the remaining words as they occur in the sentence.

Test your program with the sample data and some random data:

Example 1

INPUT: ANAMIKA AND SUSAN ARE NEVER GOING TO QUARREL ANYMORE.

OUTPUT: NUMBER OF WORDS BEGINNING AND ENDING WITH A VOWEL = 3

ANAMIKA ARE ANYMORE AND SUSAN NEVER GOING TO QUARREL

Example 2

INPUT: YOU MUST AIM TO BE A BETTER PERSON TOMORROW THAN YOU ARE TODAY.

OUTPUT: NUMBER OF WORDS BEGINNING AND ENDING WITH A VOWEL = 2

A ARE YOU MUST AIM TO BE BETTER PERSON TOMORROW THAN YOU TODAY

Example 3

INPUT: LOOK BEFORE YOU LEAP.

OUTPUT: NUMBER OF WORDS BEGINNING AND ENDING WITH A VOWEL = 0

LOOK BEFORE YOU LEAP.

Example 4

INPUT: HOW ARE YOU@

OUTPUT: INVALID INPUT