

# 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.)

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**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.**

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*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. Document the program using mnemonic names / comments, identifying and clearly describing the choice of data types and meaning of variables. [7]
3. 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]
4. 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. [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) [10]
- Programming assignments done throughout the year (by the Visiting Examiner) [5]

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

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**Turn over**

*Solve any one of the following problems*

**Question 1**

A Prime-Adam integer is a positive integer (without leading zeros) which is a prime as well as an Adam number.

Prime number: A number which has only two factors, i.e. 1 and the number itself.

Example: 2, 3, 5, 7 ... etc.

Adam number: The square of a number and the square of its reverse are reverse to each other.

Example: If  $n=13$  and reverse of 'n' = 31, then,

$$(13)^2 = 169$$

$$(31)^2 = 961 \text{ which is reverse of } 169$$

thus 13, is an Adam number.

Accept two positive integers m and n, where m is less than n as user input. Display all Prime-Adam integers that are in the range between m and n (both inclusive) and output them along with the frequency, in the format given below:

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

**Example 1**

INPUT: m = 5  
n = 100

OUTPUT: THE PRIME-ADAM INTEGERS ARE:  
11 13 31  
FREQUENCY OF PRIME-ADAM INTEGERS IS: 3

**Example 2**

INPUT: m = 100  
n = 200

OUTPUT: THE PRIME-ADAM INTEGERS ARE:  
101 103 113  
FREQUENCY OF PRIME-ADAM INTEGERS IS: 3

**Example 3**

INPUT: m = 50  
n = 70

OUTPUT: THE PRIME-ADAM INTEGERS ARE:  
NIL  
FREQUENCY OF PRIME-ADAM INTEGERS IS: 0

**Example 4**

INPUT: m = 700  
n = 450

OUTPUT: INVALID INPUT.

## Question 2

Write a program to declare a matrix  $A[ ][ ]$  of order  $(M \times N)$  where 'M' is the number of rows and 'N' is the number of columns such that the value of 'M' must be greater than 0 and less than 10 and the value of 'N' must be greater than 2 and less than 6. Allow the user to input digits ( 0 - 7 ) only at each location, such that each row represents an octal number.

Example:    2   3   1   ( decimal equivalent of 1<sup>st</sup> row = 153 i.e.  $2 \times 8^2 + 3 \times 8^1 + 1 \times 8^0$ )  
              4   0   5   ( decimal equivalent of 2<sup>nd</sup> row = 261 i.e.  $4 \times 8^2 + 0 \times 8^1 + 5 \times 8^0$ )  
              1   5   6   ( decimal equivalent of 3<sup>rd</sup> row = 110 i.e.  $1 \times 8^2 + 5 \times 8^1 + 6 \times 8^0$ )

Perform the following tasks on the matrix:

- Display the original matrix.
- Calculate the decimal equivalent for each row and display as per the format given below.

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

### Example 1

INPUT:        M = 1  
               N = 3  
               ENTER ELEMENTS FOR ROW 1: 1 4 4

| OUTPUT: | FILLED MATRIX | DECIMAL EQUIVALENT |
|---------|---------------|--------------------|
|         | 1    4    4   | 100                |

### Example 2

INPUT:        M = 3  
               N = 4  
               ENTER ELEMENTS FOR ROW 1: 1 1 3 7  
               ENTER ELEMENTS FOR ROW 2: 2 1 0 6  
               ENTER ELEMENTS FOR ROW 3: 0 2 4 5

| OUTPUT: | FILLED MATRIX    | DECIMAL EQUIVALENT |
|---------|------------------|--------------------|
|         | 1    1    3    7 | 607                |
|         | 2    1    0    6 | 1094               |
|         | 0    2    4    5 | 165                |

**Example 3**

**INPUT:**        M = 3  
                 N = 3  
                 ENTER ELEMENTS FOR ROW 1: 2 4 8

**OUTPUT:**    INVALID INPUT

**Example 4**

**INPUT:**        M = 4  
                 N = 6

**OUTPUT:**    OUT OF RANGE

**Question 3**

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

Perform the following tasks:

- (a) Check for the validity of the accepted sentence only for the terminating character.
- (b) Arrange the words in ascending order of their length. If two or more words have the same length, then sort them alphabetically.
- (c) Display the original sentence along with the converted sentence.

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

**Example 1**

**INPUT:**                AS YOU SOW SO SHALL YOU REAP.

**OUTPUT:**            AS YOU SOW SO SHALL YOU REAP.  
                         AS SO SOW YOU YOU REAP SHALL

**Example 2**

**INPUT:**                SELF HELP IS THE BEST HELP.

**OUTPUT:**            SELF HELP IS THE BEST HELP.  
                         IS THE BEST HELP HELP SELF

**Example 3**

**INPUT:** BE KIND TO OTHERS.

**OUTPUT:** BE KIND TO OTHERS.  
BE TO KIND OTHERS

**Example 4**

**INPUT:** NOTHING IS IMPOSSIBLE#

**OUTPUT:** INVALID INPUT