

II TERM EXAMINATION : 2024-25
Class - XII (ISC)
Subject - Computer Science Paper 2

Time Allowed : Three Hours

Maximum Marks : 30

(Candidates are allowed an 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.
(Algorithm should be expressed clearly using any standard scheme such as pseudo code or in steps which are simple enough to be obviously computable) [3]
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 print out (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 print out of the output in the format specified in the problem. [3]
5. Project File [15]

Solve any ONE of the following problems.

Question 1

Write a program to declare a square matrix $M[][]$ of order 'N'. Check if the matrix is a Doubly Markov matrix or not. A matrix which satisfies the following conditions are Doubly Markov matrix

- (i) All elements are greater than or equal to 0
- (ii) Sum of each row is equal to 1.
- (iii) Sum of each column is equal to 1.

Accept 'N' from the user where $3 \leq N \leq 9$. Display an appropriate error message if 'N' is not in the given range or the entered numbers are negative. Allow the user to create a matrix and check whether the created matrix is a Doubly Markov matrix or not

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

Example 1 INPUT : N = 3

Enter elements in the matrix: 0.5, 0.25, 0.25, 0.25, 0.75, 0.0, 0.25, 0.0, 0.75

OUTPUT : FORMED MATRIX

0.5 0.25 0.25

0.25 0.75 0.0

0.25 0.0 0.75

IT IS A DOUBLY MARKOV MATRIX

Example 2 INPUT : N = 3

Enter elements in the matrix : 1.5, 3, 0.15, 0.25, 4, 1.0, 0.25, 1.0, 3

OUTPUT: FORMED MATRIX

1.5 3 0.15

0.25 4 1.0

0.25 1.0 3

IT IS NOT A DOUBLY MARKOV MATRIX

Example 3 INPUT : N = 2

Enter elements in the matrix: 0.8, -4.0, 0.9, 3.5

OUTPUT : NEGATIVE NUMBERS ENTERED. INVALID ENTRY

Example 4 INPUT : N = 12

OUTPUT : SIZE IS OUT OF RANGE. INVALID ENTRY

This paper consists of 2 printed pages.

Turn Over

Question 2

Hamming numbers are positive integer numbers whose prime factors include 2,3 and 5 only

Example:

$n = 6$ is an hamming number as $6 = 2 \times 3$. So its prime factors are limited to 2, 3

$n = 8$ is an hamming number as $8 = 2 \times 2 \times 2$ and it has only 2 as its prime factors

$n = 90$ is an hamming number as $90 = 2 \times 3 \times 3 \times 5$ which has only 2, 3, 5 as prime factors

$n = 14$ is not a hamming number as $14 = 2 \times 7$.It has 7 as one of its prime factor

$n = 44$ is not a hamming number as $44 = 2 \times 2 \times 11$. It has 11 as one of its prime factors

Design a program to accept any positive integer number and check if it is a Hamming number or not. Display the result with an appropriate message in the format specified below. The program should also generate error message if a negative number is entered.

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

- Example 1** INPUT : Enter any number : 3600
OUTPUT : 3600 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$
3600 IS A HAMMING NUMBER
- Example 2** INPUT : Enter any number : 5832
OUTPUT : 5832 = $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$
5832 IS A HAMMING NUMBER
- Example 3** INPUT : Enter any number : 7854
OUTPUT : 7854 = $2 \times 3 \times 7 \times 11 \times 17$
7854 IS NOT A HAMMING NUMBER
- Example 4** INPUT : Enter a number : -120
OUTPUT : NEGATIVE NUMBER ENTERED. INVALID INPUT

Question 3

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

Perform the following tasks:

- Count number of vowels and consonants present in each word
- Generate the output of the frequency in form of a bar graph, where V denotes vowels and C consonants as shown below:

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

- Example 1** INPUT : HOW ARE YOU?
OUTPUT : WORD COUNT
HOW V
CC
ARE VV
C
YOU VV
C
- Example 2** INPUT : GOOD DAY!
OUTPUT : WORD COUNT
GOOD VV
CC
DAY V
CC
- Example 3** INPUT : LONG LIVE THE KING#
OUTPUT : INCORRECT TERMINATING CHARACTER. INVALID INPUT

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