COMPUTER SCIENCE
Paper – 2
(Planning Session and Examination Session : Three hours)

Instructions

As it is a practical examination the candidate is expected to do the following:

(i) Write an algorithm for the selected problem
(ii) Write a program in C++/Java. Document your program by using mnemonic names and comments
(iii) Test run the program on the computer using the given test data and get a print out (hard copy) in the format specified in the problem along with the program listing.

Solve any one of the following problem.

Question 1.
A Smith number is a composite number, the sum of whose digits is the sum of the digits of its prime factors obtained as a result of prime factorization (excluding 1). The first few such numbers are 4, 22, 27, 58, 85, 94, 121……

Example:

1. 666
   Prime factors are 2, 3, 3, and 37
   Sum of the digits are (6 + 6 + 6) = 18
   Sum of the digits of the factors (2 + 3 + 3 + (3 + 7)) = 18

2. 4937775
   Prime factors are 3, 5, 5, 65837
   Sum of the digits are (4 + 9 + 3 + 7 + 7 + 7 + 5) = 42
   Sum of the digits if the factors (3 + 5 + 5 + (6 + 5 + 8 + 3 + 7)) = 42

Write a program to input a number and display whether the number is a Smith number or not.

Sample data:

Input	94	Output	SMITH Number
Input	102	Output	NOT SMITH Number
Input	666	Output	SMITH Number
Input	999	Output	NOT SMITH Number

Question 2.
A sentence is terminated by either ".", "!" or "?" followed by a space. Input a piece of text consisting of sentences Assume that there will be a maximum of 10 sentences in block letters.

Write a program to:

(i) Obtain the length of the sentence (measured in words) and the frequency of vowels in each sentence
(ii) Generate the output as shown below using the given data.

Sample data:

INPUT
HELLO! HOW ARE YOU? HOPE EVERY THING IS FINE. BEST OF LUCK.

OUTPUT

Sentence	No. of Vowels	No. of Words
1	2	1
2	5	3
3	8	4
4	3	3

Sentence	No. of words/vowels
1	VVVVVV WWW
2	VVVVVVVVVVVVVV WWWWWWWWW
3	VVVVVVVVVVVVVVVVVVVVVVV WWWWWWWWWWWW
4	VVVVVVVVV WWWWWWWWW

Scale used: 1:3

Question 3.

Given a square matrix list[ ][ ] of order 'n'. The maximum value possible for 'n' is 20. Input the value for 'n' and the positive integers in the matrix and perform the following tasks:

1. Display the original matrix
2. Print the row and column position of the largest element of the matrix
3. Print the row the column position of the second largest element of the matrix
4. Sort the elements of the rows in the ascending order and display the new matrix

Sample data:

INPUT:

N=3

List [ ][ ]

5	1	3
7	4	6
9	8	2

OUTPUT

5	1	3
7	4	6
9	8	2

The largest element 9 is in row 3 and column 1

The second largest element 8 is in row 3 and column 2

<u>Sorted List</u>

1	3	5
4	6	7
2	8	9