COMPUTER SCIENCE – 2002

Paper-2

(PRACTICAL)

(Planning Session : Two hours)

(Examination Session: one hour)

(Maximum Marks: 100)

INSTRUCTIONS

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

(a)   Write an algorithm for the selected problem.

(b)   Prepare an Input/Process/Output table indicating the required inputs for the problem. Also state the method/formula for solving the problem and mention the required output.

(c)   Write a program in C++, 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 alongwith the program listing.

Solve any **one** *of the following problems*

Q1.   Twins primes are consecutive prime numbers whose difference is 2. For example, (3,5), (11,13), (17,19) are all twin primes. We define the distance of any twin prime pair from a positive integer as follows.

If ($p1, p2$) is a twin prime pair and n is a positive integer then the distance of the twin prime from n is:
minimum(abs(n-p1), abs(n-p2)) where abs returns the absolute value of its argument, and *minimum* returns the smaller of its two arguments.

Write a program that reads in a positive integer n and prints out the twin prime pair that has the least distance from n.

For example if n is 30 the pair is (29,31), if n is 13 it is (11,13), if n is 49 it is (41,43). If n is 54 it is (59,61).

Sample data:

Input:

Give the number : 34

Output:

Number read in is : 34

Pl=29 p2=31

Input:

Give the number : 60

Output:

Number read in is 60

Pl=59 p2=61

Q2.   Write the program to do the following:

Read in an integer n (which can be at most 50). Then read in n integers one by one and store them in an array *data* from index 0 to n-1. Now we want to rearrange the integers in *data* in the following way :

Find the maximum value in *data* and put in the centre of the array (that is at (n/2); find the next largest value and put it to its right; then the next largest and place it to its left and so on alternating right and left until all integers in *data* are done. For example, if the array is initially:

7, 3, 1, 6, 4, 2, 5 then after rearranging it becomes 1, 3, 5, 7, 6, 4, 2

However, since we have very little memory, you are not allowed to use any other array from *data.*

Sample data:

Input:

Give the number of integers: 5

Give integer 1 : 7
Give integer 2 : 9
Give integer 3 : 2
Give integer 4 : 5
Give integer 5 : 6

Output:
Original array
7 9 2 5 6
rearranged array
2 6 9 7 5

Input:
Give the number of integers: 6

Give integer 1 : 5
Give integer 2 : 1
Give integer 3 : 9
Give integer 4 : 8
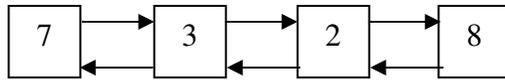Give integer 5 : 2
Give integer 6 : 4

]

Output:
Original array
5 1 9 8 2 4
rearranged array
2 5 9 8 4 1

Q3.   A mathematician who is working with extremely large integers represents them using a doubly linked list. For example, the number 7328 will be represented as the doubly linked list with four nodes:

The predecessors of the first node and the successor of the last node are null.

Write a program that reads in two numbers (assume they are integers for testing), converts them to the above representation, prints them out with each digit separated by commas and checks should work on the representation and not on the integers,. Here are sample outputs.

Sample data:
Input:
Give the first number : 34563
Give the second number: 34562

Output:
First number : 3,4,5,6,3
Second number: 3,4,5,6,2
unequal

Input:
Give the first number : 56432
Give the second number: 56432

Output:
First number : 5,6,4,3,2
Second number : 5,6,4,3,2
equal

***