

Problem 4 of 4

Birla Institute of Technology & Science, Pilani
Data Structures & Algorithms (CS F211)
Lab Exam
(Closed Book)

Date: 17th April, 2016

Time: 2 Hours 45 minutes (4 problems)

Total Marks: (4 + 6 + 10 + 20 = 40 Marks)

General Instructions:

- There are four problems to solve in this lab exam.
- The problems are arranged in increasing order of difficulty. Weightage of each problem is approximately proportional to its difficulty level (P1 = 4, P2 =6, P3=10, P4=20).
- A total of 2 hours and 45 minutes will be given for solving all 4 problems.
- Only one test case in each problem will be available during first 2 hours and 30 minutes. All but one test case will be made available in last 15 minutes.
- Separate submission will be required for each of the problem. Make sure to select correct problem while uploading a solution.
- Each test case carries some marks. For any output, other than “correct”, for a particular test case will be awarded zero (0) marks.
- All input expressions should be read from stdin and output should be printed on stdout.
- Only the last submission by the student for each problem, before end of exam, will be considered for evaluation.

Warnings (Possible Reasons for Cancellation of Lab Exam):

- Possession of any previously written code (irrespective of size, relevance, ownership, medium)
- Possession of any removable media or mobile.
- Attempt to access any machine other than allotted local machine and the Online Judge Server.

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Input Format:

You will be given a 4x4 integer matrix (one row per line). The numbers will be separated by blank spaces.

The entries of the matrix will represent a permutations of (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15). For problem P4, the following matrix is used as example:

0	1	3	4
5	2	7	8
9	6	10	11
13	14	15	12

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Problem 4: 15 Puzzle (20 Marks)

Problem Statement:

In 15 puzzle, you are given a 4x4 matrix which represents a permutation of (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15). The number "0" represents an empty space. You can "slide" the numbers adjacent to "0" so that the adjacent number takes the position of "0", and "0" takes the position of the adjacent number.

Your task is to find the shortest sequence of slides so that at the end "0" is at the (4, 4) position of the matrix and the remaining numbers are in sorted order.

Output Format:

In each line write the number which you will slide to "0".

Sample Input:

0	1	3	4
5	2	7	8
9	6	10	11
13	14	15	12

Sample Output:

1
2
6
10
11
12

Explanation:

0	1	3	4	1	1	0	3	4	2
5	2	7	8	5	5	2	7	8	
9	6	10	11	9	9	6	10	11	
13	14	15	12	13	13	14	15	12	
1	2	3	4	6	1	2	3	4	10
5	0	7	8	5	5	6	7	8	
9	6	10	11	9	9	0	10	11	
13	14	15	12	13	13	14	15	12	
1	2	3	4	11	1	2	3	4	12
5	6	7	8	5	5	6	7	8	
9	10	0	11	9	9	10	11	0	
13	14	15	12	13	13	14	15	12	
1	2	3	4						
5	6	7	8						
9	10	11	12						
13	14	15	0						