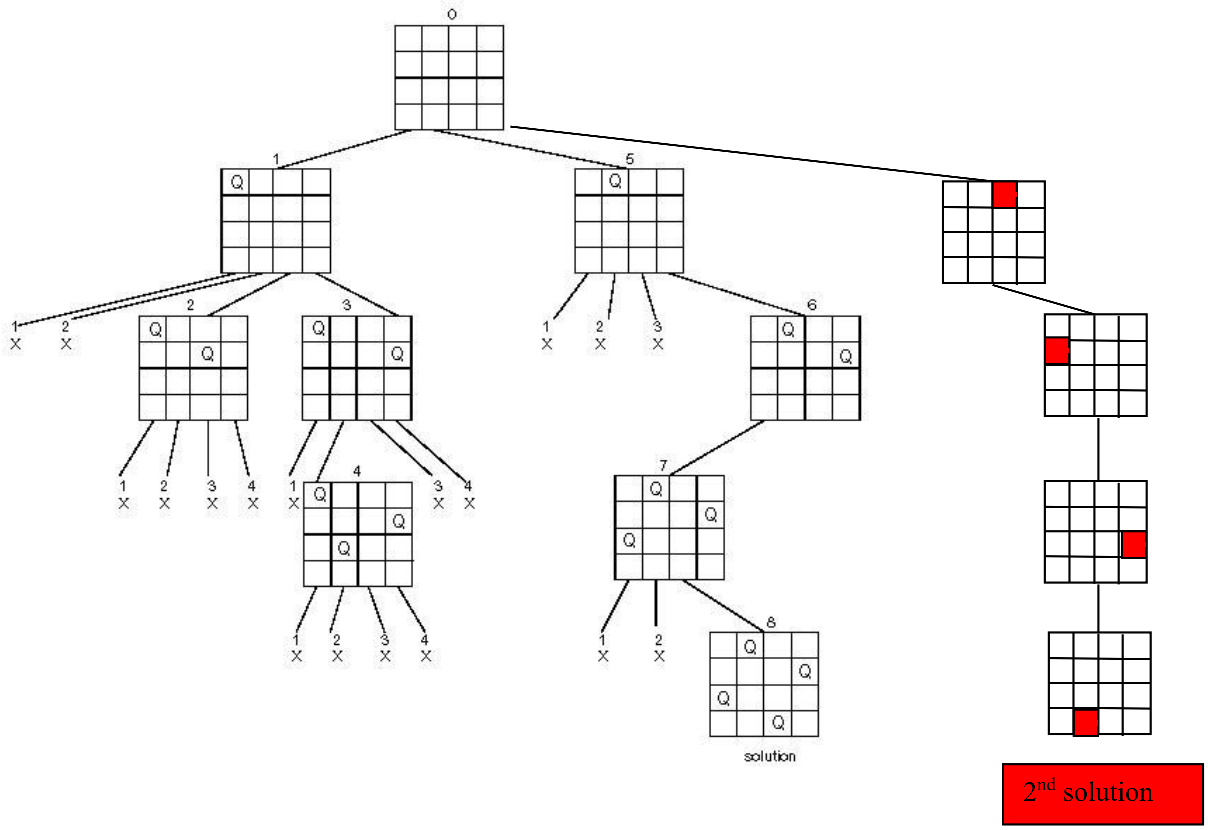
Problem Session Week 11
Thursday 3 May

Suggested Solutions

Question 1

Continue the backtracking search for a solution to the four-queens problem, which was given in this week's lecture, to find the second solution to the problem. Explain how the board's symmetry can be used to find the second solution to the four-queens problem.

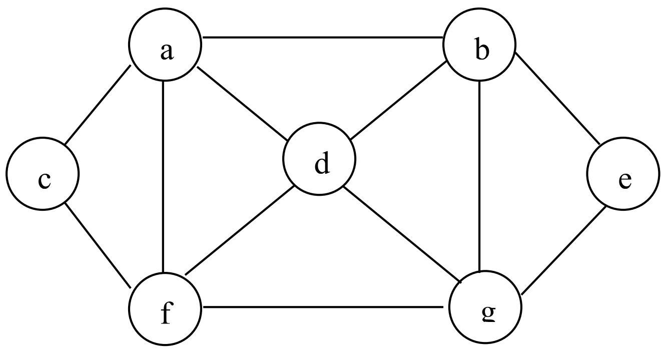
Solution:



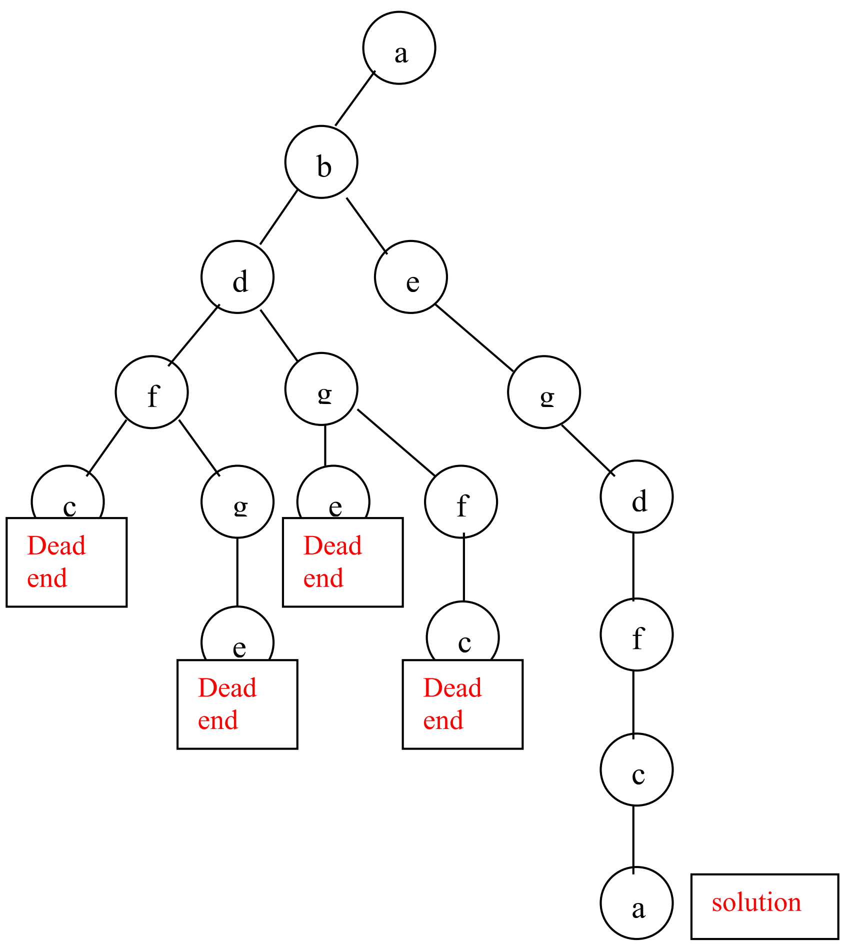
The second solution can be obtained by following way:
If there is a queen at position (i, j), using board's symmetry then in the second solution, it will have a queen at position (i, 4-j+1) (i=1, 2, 3, 4; j=1,2,3,4).

Question 2

Apply backtracking to the problem of finding a Hamiltonian circuit in the following graph (starting from vertex *a*)



Solution:

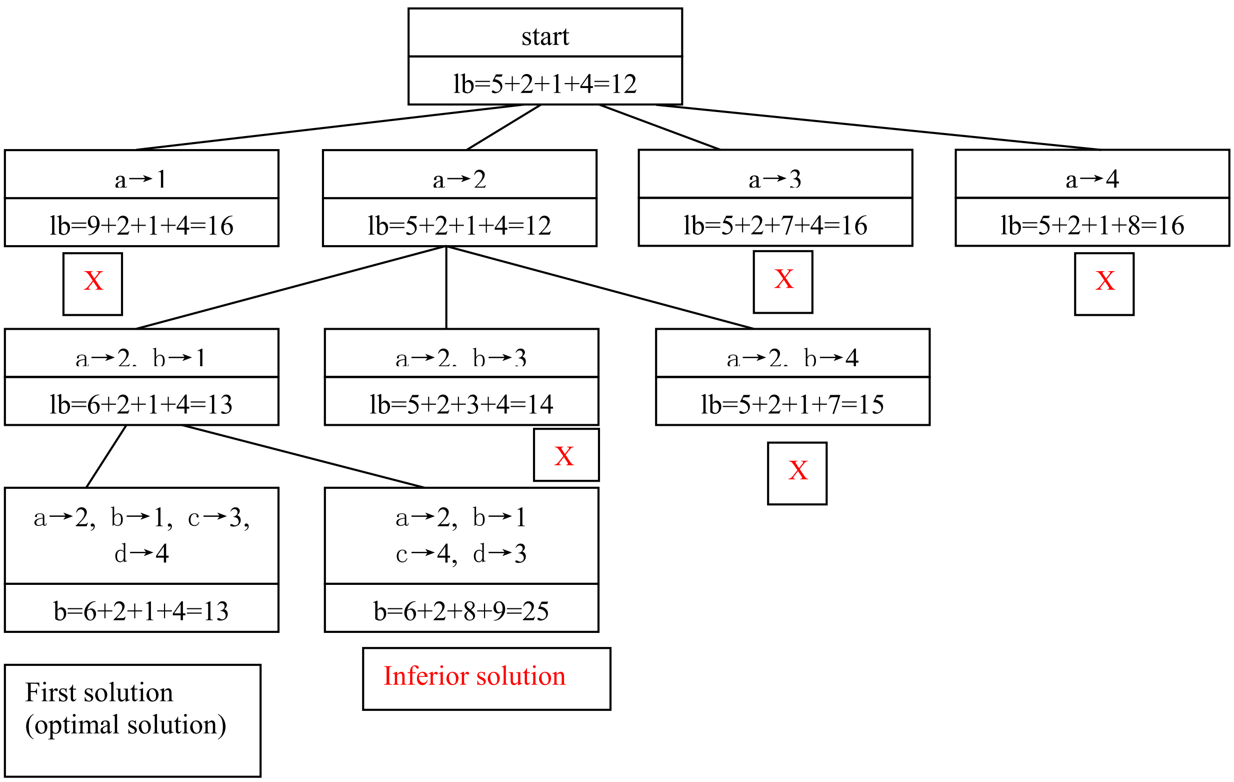


Question 3

Solve the same instance of the assignment problem as the one solved in the section by the best-first branch-and-bound algorithm with the bounding function based on matrix columns rather than rows.

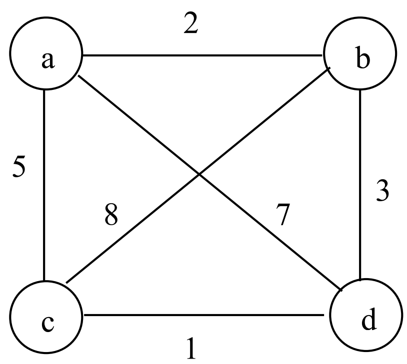
	Job1	Job1	Job1	Job1
Person a	9	2	7	8
Person b	6	4	3	7
Person c	5	8	1	8
Person d	7	6	9	4

Low bound =



Question 4

Apply the branch-and-bound algorithm to solve the travelling salesman problem for the following graph.



Suggested Solution:
To reduce the complexity, we can assume that, b is before c in the tour. The lower bound for each node can be computed by

Node 0: $lb = \lceil [(2+5)+(2+3)+(1+5)+(1+3)]/2 \rceil = 11$

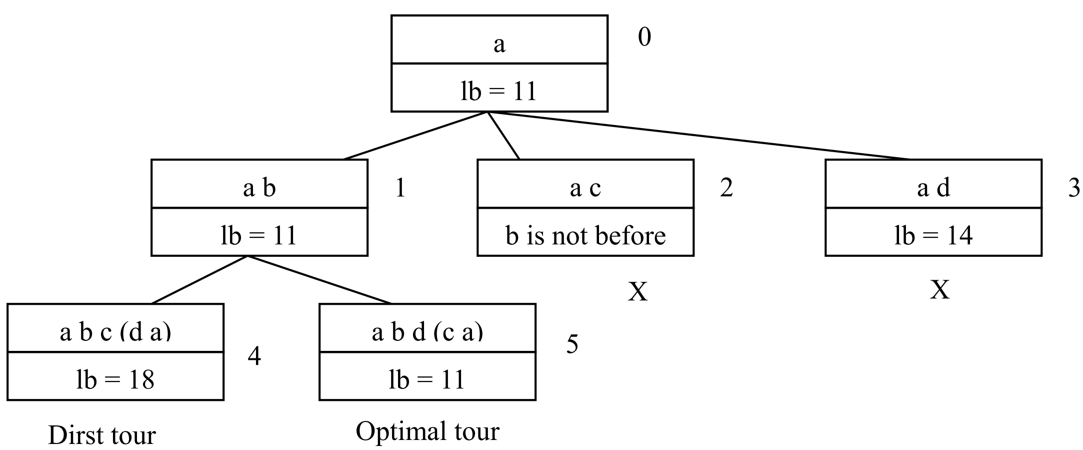
Node 1: $lb = \lceil [(2+5)+(2+3)+(1+5)+(1+3)]/2 \rceil = 11$

Node 2: ignored as b is not before c.

Node 3: $lb = \lceil [(2+7)+(2+3)+(1+5)+(1+7)]/2 \rceil = 14$

Node 4 leads to a tour with $lb = 18$

Node 5 leads to a optimal tour with *lb*=11.



Solutions: a b d c a

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