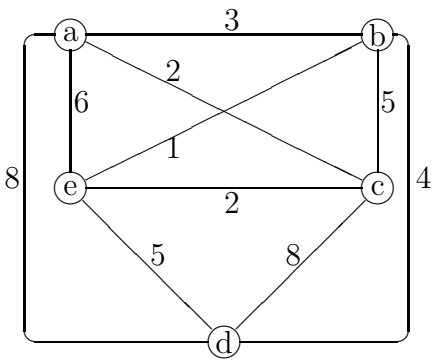
T-79.4201 **Autumn 2006**
Search Problems and Algorithms
Tutorial 3, 5 October
Problems

1. Determine an optimal TSP route for the problem instance given below, using the Branch and Bound method discussed at the lectures.



2. Design a Branch and Bound method for solving the MAX CUT optimisation problem discussed in Problem 4 of last week's tutorial. Indicate in particular what is your notion of a partial solution, and what upper bounding heuristic you are using to prune the search. Present a small example of how your method works.

3. Consider the relationship between branch-and-bound optimisation and the A* algorithm. Reformulate the branch-and-bound approach to solving the TSP problem discussed at last week's lecture as an A* graph search. What are the nodes, edges and edge costs of the search graph? What are the functions f, g and h used in the A* algorithm in this case?

4. Prove that if the search graph (X, N) is finite, then an A* search using an admissible heuristic h always terminates with an optimal (i.e. minimum length) path from the start node x_0 to some goal node $x^* \in X^*$. (*Hint:* Show that until the algorithm terminates, there is always some node $x \in X$ in OPEN with the property that x lies on some optimal start-to-goal path and $f(x) \leq f^*$, where f^* is the cost of an optimal path.)