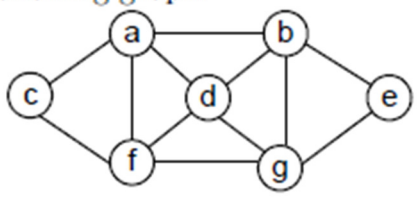
MA/CSSE 473 HW 16 textbook problems and hints

Problem #1 (5) 12.1.5 [12.1.4] **(Hamiltonian circuit backtracking)** Show the state space.

4. Apply backtracking to the problem of finding a Hamiltonian circuit in the following graph.



Author's hint:

> 4. Another instance of this problem is solved in the section.

Problem #2 (5) 12.2.1 (data structure for best-first branch-and-bound)

1. What data structure would you use to keep track of live nodes in a best-first branch-and-bound algorithm?

Author's hint:

> 1. What operations does a best-first branch-and-bound algorithm perform on the live nodes of its state-space tree?

Problem #3 (5) 12.2.5 (use branch-and-bound to solve instance of knapsack problem)

5. Solve the following instance of the knapsack problem by the branch-and-bound algorithm

item	weight	value
1	10	\$100
2	7	\$63
3	8	\$56
4	4	\$12

$W = 16$

Author's hint:

> 5. A similar problem is solved in the section.

Problem #4 (10) 12.3.1 (nearest-neighbor algorithm example) (4, 6))

1. a. Apply the nearest-neighbor algorithm to the instance defined by the distance matrix below. Start the algorithm at the first city, assuming that the cities are numbered from 1 to 5.

$$\begin{bmatrix} 0 & 14 & 4 & 10 & \infty \\ 14 & 0 & 5 & 8 & 7 \\ 4 & 5 & 0 & 9 & 16 \\ 10 & 8 & 9 & 0 & 32 \\ \infty & 7 & 16 & 32 & 0 \end{bmatrix}$$

b. Compute the accuracy ratio of this approximate solution.

Author's hint

1. a. Start by marking the first column of the matrix and finding the smallest element in the first row and an unmarked column.

b. You will have to find an optimal solution by exhaustive search as explained in Section 3.4.

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