

Problem 1: 32.1-2

Suppose that all characters in the pattern P are different. Show how to accelerate NAIVE-STRING-MATCHER to run in time $O(n)$ on an n -character text T .

Problem 2: 32.2-3

Show how to extend the Rabin-Karp method to handle the problem of looking for a given $m \times m$ pattern in an $n \times n$ array of characters. (The pattern may be shifted vertically and horizontally, but it may not be rotated.)

Problem 3: 34.2-2

Prove that if G is an undirected bipartite graph with an odd number of vertices, then G is nonhamiltonian.

Problem 4: 34.2-7

Show that the hamiltonian-path problem can be solved in polynomial time on directed acyclic graphs. Give an efficient algorithm for the problem.

Problem 5: 34.3-1

Verify that the circuit in Figure 34.8(b) is unsatisfiable.

Problem 6: 34.5-6

Show that the hamiltonian-path problem is NP-complete.

Problem 7: The longest-simple-cycle problem is the problem of determining a simple cycle (no repeated vertices) of maximum length in a graph. Show that this problem is NP-complete.

Problem 8: Professor Nixon proposes the following heuristic to solve the vertex-cover problem. Repeatedly select a vertex of highest degree, and remove all of its incident edges. Give an example to show that the professor's heuristic does not have an approximation ratio of 2.

(Hint: Try a bipartite graph with vertices of uniform degree on the left and vertices of varying degree on the right.)