Interview Questions: Maximum Flow

Warning: The hard deadline has passed. You can attempt it, but **you will not get credit for it**. You are welcome to try it as a learning exercise.

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Question 1

Fattest path. Given an edge-weighted digraph and two vertices s and t, design an $E \log E$ algorithm to find a fattest path from s to t. The *bottleneck capacity* of a path is the minimum weight of an edge on the path. A *fattest path* is a path such that no other path has a higher bottleneck capacity.

Question 2

Perfect matchings in k-regular bipartite graphs. Suppose that there are n men and n women at a dance and that each man knows exactly k women and each woman knows exactly k men (and relationships are mutual). Show that it is always possible to arrange a dance so that each man and woman are matched with someone they know.

Question 3

Maximum weight closure problem. A subset of vertices S in a digraph is *closed* if there are no edges pointing from S to a vertex outside S. Given a digraph with weights (positive or negative) on the *vertices*, find a closed subset of vertices of maximum total weight.

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