Interview Questions: Maximum Flow

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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.

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Thank you for your response.

Hint: design a linear-time subroutine that takes a real-number T and determines if there is a path from s to t of bottleneck capacity greater than or equal to T.

1 / 1 points

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.

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Thank you for your response.

Hint: formulate the bipartite matching problem as a maxflow problem; find a (fractional) feasible flow of value n; conclude that there is a perfect matching.

1 / 1 points

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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Thank you for your response.

Hint: formulate as a mincut problem; assign edge (v, w) a weight of infinity if there is an edge from v to w in the original digraph.