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**TO PASS** 1% or higher

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# Interview Questions: Minimum Spanning Trees (ungraded)

**TOTAL POINTS 3**

1. **Bottleneck minimum spanning tree.** Given a connected edge-weighted graph, design an efficient algorithm to find a *minimum bottleneck spanning tree*. The bottleneck capacity of a spanning tree is the weights of its largest edge. A minimum bottleneck spanning tree is a spanning tree of minimum bottleneck capacity. **1 / 1 point**

> Bottleneck minimum spanning tree. Given a connected edge-weighted graph, design an efficient algorithm to find a minimum bottleneck spanning tree. The bottleneck capacity of a spanning tree is the weights of its largest edge.

**Correct**
*Hint*: prove that an MST is a minimum bottleneck spanning tree.

*Extra challenge:* Compute a minimum bottleneck spanning tree in linear time in the worst case. Assume that you can compute the median of $n$ keys in linear time in the worst case.

2. **Is an edge in a MST.** Given an edge-weighted graph $G$ and an edge $e$, design a linear-time algorithm to determine whether $e$ appears in some MST of $G$. **1 / 1 point**

*Note:* Since your algorithm must take linear time in the worst case, you cannot afford to compute the MST itself.

> Is an edge in a MST. Given an edge-weighted graph G and an edge e, design a linear-time algorithm to determine whether e appears in some MST of G.
> Note: Since your algorithm must take linear time in the worst case, you cannot afford to computer the MST itself.

**Correct**
*Hint:* consider the subgraph $G'$ of $G$ containing only those edges whose weight is strictly less than that of $e$.

3. **Minimum-weight feedback edge set.** A *feedback edge set* of a graph is a subset of edges that contains at least one edge from every cycle in the graph. If the edges of a feedback edge set are removed, the resulting graph is acyclic. Given an edge-weighted graph, design an efficient algorithm to find a feedback edge set of minimum weight. Assume the edge weights are positive. **1 / 1 point**

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**Correct**
*Hint:* complement of an MST.