Solution. We will consider a binary search on k, with an upper bound of n and a lower bound of 0. For each value of k, we will use a modified directed graph, say G_k. In this graph, each vertex v is split into v_{in} and v_{out}, and each edge $(u, v) \in E$ is connected in both directions with a capacity of 1. For each vertex, we will add an edge between v_{in} and v_{out} with a capacity of k. We will also initialize a source s, which connects to each of the v_{out} vertices, and a sink t, which connects to the v_{in} vertices. All of these new edges should have capacities equal to the degree of the corresponding vertices in G. For each of these values of k, we can then find the maximum flow from s to t.

The v_{in} vertices can receive at most k units of flow, so if we can find a maximum flow that matches the total capacity going into each v_{in} vertex, then we have found a valid k-orientation. If the maximum flow equals the sum of the degrees of all vertices (which is the total capacity going out of the source s), then the flow successfully represents a k-orientation. Our binary search will take $O(\log n)$ iterations, and for each k, we will use the Ford-Fulkerson algorithm to find the maximum flow, which takes $O(m^2)$ time in the worst case. Therefore, the overall time complexity of the algorithm is $O(m^2 \log n)$.