Data Structures and Algorithms

Describe and justify Dijkstra’s algorithm for finding the shortest path between two vertices in a directed graph with non-negative lengths associated with its edges. [8 marks]

How can this algorithm be extended to consider graphs with some negative lengths? [6 marks]

By considering the graph on \{A, B, C\} with \(A \rightarrow B\) having length \(-2\), \(B \rightarrow A\) having length 1 and \(A \rightarrow C\) having length 1, or otherwise, show that the “shortest path” is not always well defined if there are negative lengths. When is it well defined? [6 marks]