Data Structures and Algorithms Spring 2024 — Problem Sets

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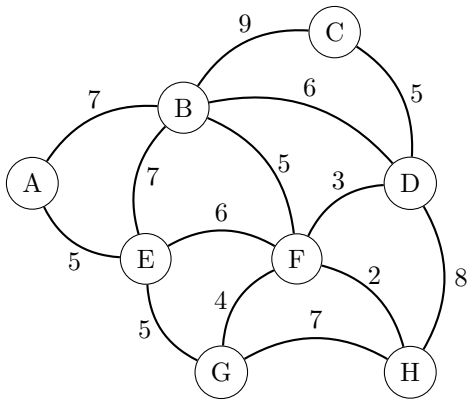
Week 12. Problem set

1. Run Prim-Jarník algorithm [Cormen, §21.2] on the following graph, starting at vertex C. Assuming that the algorithm is using Binary heap implementation [Cormen, §6] of a priority queue, show the state of the Binary heap after each iteration of the algorithm (i.e. after adding each new vertex to the MST). The graph contains 8 vertices, which means that your solution must provide 8 states of the Binary heap. Each heap state must be represented as an array. No justification is required.



2. Suppose that all edge weights in a graph are integers in the range from 1 to $|V|$. How fast can you make Kruskal's algorithm run by modifying it somehow? What if the edge weights are integers in the range from 1 to W for some constant W? Justify your answer in at most two paragraphs.

References

[Cormen] T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein. *Introduction to Algorithms, Fourth Edition.* The MIT Press 2022