Tutorial-5

● Graded

Student

Abhinav Shripad

Total Points

3 / 3 pts

Question 1

(no title)

3 / 3 pts

✓ **+ 3 pts** **Assuming negative weight cycles:** Correct counterexample for Dijkstra’s algorithm failing

+ 1 pt **Assuming no negative weight cycles / simple path** Claiming that there will exist shortest paths without any cycles, i.e., shortest paths are simple

+ 1 pt **Assuming no negative weight cycles / simple path** Claiming that every simple path from s to any vertex v contains exactly 1 outgoing edge of s

+ 0.5 pts **Assuming no negative weight cycles / simple path** Claiming that adding a positive constant to all the negative edges (to make them positive) does not affect the shortest paths

+ 0.5 pts **Assuming no negative weight cycles / simple path** Claiming that run of Dijkstra on $G\prime$ corresponds to a run of Dijkstra on G

+ 0.6 pts Written ”I do not know how to approach this problem”

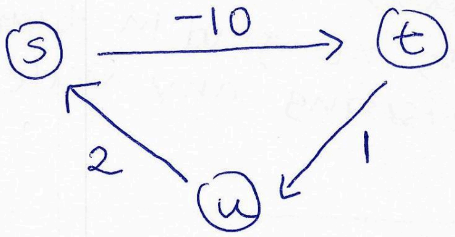
+ 0 pts Incorrect

COL351: Analysis and Design of Algorithms
Tutorial 5

Name: Abhinav Rajesh Shripad
Entry number: 2022CS11596

Date: Aug 29, 2024
Group: 3

→ False



by ⓑ.
Source :- s
Destination :- t

by Dijkstra → dis(s-t) = -10
found in the first
pop of priority queue.

Better path:- s → t → u → s → t
cost = -10 + 1 + 2 + -10 = -17
-17 < -10

→ Dijkstra is ~~NO~~ not optimum
path

If we consider no cycle then, it is true.
Increase all the outgoing edges from s
by some Δ to make them positive and apply
Djskstra and then subtract Δ from final answer.
Answer → Optimum because since no cycle
we don't travel any edge twice and ~~visit~~
~~all paths from~~ visit any vertex twice.
So all optimum paths from s travel exactly
1 outgoing edge, ~~and the~~

thus the effect of this edgeis thus nullified by making Δ increment and decreasing the final answer by Δ.

If cycle exists, but NO negative weight cycle, then also True, as like previous argument, no good in travelling any edge twice and visiting any vertex twice.

Final Answer

- → No Cycle → Dijkstra Applies
- → Cycle
    - → Negative Cycle → Dijkstra Fails
    - → No negative cycle → Dijkstra pass.