

**CSE 207**  
**CT 2-SET A**  
**Date: 10/01/2022**  
**Time: 20 minutes**

**Name:** \_\_\_\_\_

**ID:** \_\_\_\_\_

1. Suppose we define a different kind of graph where we have weights on the vertices and not the edges. Does the shortest-paths problem make sense for this kind of graph? If so, give a precise and formal description of the problem. If not, explain why not.
2. Consider a directed graph with positive weights. Give an algorithm that receives a node  $s$  and prints the shortest cycle that contains  $s$ .
3. Professor Adam has two children who, unfortunately, dislike each other. The problem is so severe that not only do they refuse to walk to school together, but in fact each one refuses to walk on any block that the other child has stepped on that day. The children have no problem with their paths crossing at a corner. Fortunately both the professor's house and the school are on corners, but beyond that he is not sure if it is going to be possible to send both of his children to the same school. The professor has a map of his town. Show how to formulate the problem of determining whether both his children can go to the same school as a maximum-flow problem.