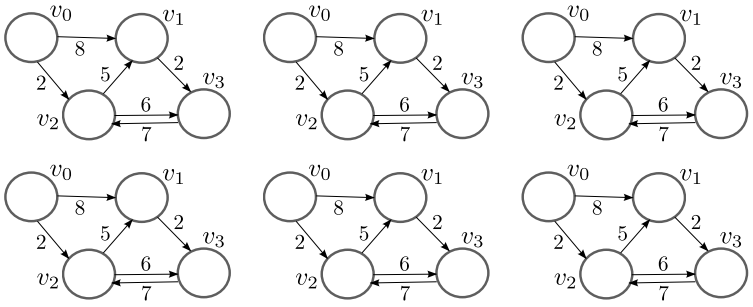
CMPS 2200 Introduction to Algorithms – Fall 17

11/9/17

Lab Worksheet

1. **Bellman-Ford**
   Run Bellman-Ford's algorithm on the graph below, with source vertex v_0.

   (a) Show all the different stages of the algorithm, including d-values for each vertex and the tree edges stored in the predecessor array. Also draw the shortest path tree edges into the graph.

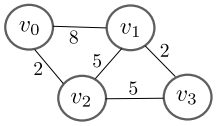


   (b) List the shortest paths from v_0 to all other vertices.

2. **MST**

   (a) How many different MSTs does this graph have?

   (b) Run Prim's algorithm on this graph. Similar to question 1 on homework 8 for Dijkstra's algorithm, list all the different stages: The key for each vertex, the priority queue, the vertex extracted from the priority queue, and the predecessor array storing the tree.



3. **True or False**
   For each of these statements indicate whether it is true or false. If a statement is true, prove its correctness. If it is false, provide a counterexample.

   (a) If G has a cycle with a unique heaviest edge e, then e cannot be part of any MST.

   (b) Let e be any edge of minimum weight in G. Then e must be part of some MST.

   (c) The shortest path between two nodes is necessarily part of some MST.