

# Assignment 4: CS21003 Algorithms 1

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1. Suppose we perform a sequence of  $m$  union/find operations. And we are using union by rank and path compression heuristic. Then prove the following. Prove that, if  $m = n^2$ , then the total running time of these  $m$  operations is  $\mathcal{O}(m)$ .

**[10 Marks]**

2. Given a directed graph, where all edge costs are positive, present an algorithm to find the top 5 shortest cost paths from node  $s$  to node  $g$ . You may assume at least 5 paths exist. Show the working on an example of at least 10 nodes. Analyze the complexity of your algorithm.

**[10 Marks]**