

1) 20 pts

Mark the following statements as **TRUE** or **FALSE**. No need to provide any justification.

[ **TRUE/FALSE** ]

All the NP-hard problems are in NP.

[ **TRUE/FALSE** ]

Given a weighted graph and two nodes, it is possible to list all shortest paths between these two nodes in polynomial time.

[ **TRUE/FALSE** ]

In the memory efficient implementation of Bellman-Ford, the number of iterations it takes to converge can vary depending on the order of nodes updated within an iteration

[ **TRUE/FALSE** ]

There is a feasible circulation with demands  $\{d_v\}$  if  $\sum_v d_v = 0$ .

[ **TRUE/FALSE** ]

Not every decision problem in P has a polynomial time certifier.

[ **TRUE/FALSE** ]

If a problem can be reduced to linear programming in polynomial time then that problem is in P.

[ **TRUE/FALSE** ]

If we can prove that  $P \neq NP$ , then a problem  $A \in P$  does not belong to NP.

[ **TRUE/FALSE** ]

If all capacities in a flow network are integers, then every maximum flow in the network is such that flow value on each edge is an integer.

[ **TRUE/FALSE** ]

In a dynamic programming formulation, the sub-problems must be mutually independent.

[ **TRUE/FALSE** ]

In the final residual graph constructed during the execution of the Ford–Fulkerson Algorithm, there's no path from sink to source.