

COL 351 Quiz 6B

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TOTAL POINTS

10 / 10

QUESTION 1

1 Q1 10 / 10

$n = k$ in G

0 + 0 pts No submission / Incorrect

! + 2 pts We first show that this problem is in NP.

The verifier takes as input a graph G and a subset S of size k vertices and checks if S is an independent set or not

! + 2 pts We now reduce the independent set problem to the LargeIndSet problem. Let (G, k) be an input to the independent set problem.

We map it to an input $(G!, k!)$ of the LargeIndSet problem. Let n be the number of vertices in G . We obtain $G!$ as follows: we add a set W of n new vertices to G and there are no edges incident with any vertex in W .

! + 1 pts The parameter $k! = k + n$.

! + 1 pts Note that if $n!$ is the number of vertices in $G!$, then

$n! = 2n$ and so, $k! \geq n!/2$

! + 2 pts Argue that G has an independent set of size k iff $G!$ has a large independent set of size $k!$.

Suppose G has an independent S of size k . Then $S \cup W$ is an independent set in $G!$ of size $n + k = k!$

! + 2 pts Conversely, suppose $G!$ has an independent set S of size $k!$. Now at most n of the vertices in S can belong to W . The remaining vertices $S \setminus W$ belong to G and form an independent set in G . Thus, we have an independent set of size at least $k!$

