The Theory of Computation

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Addison-Wesley-Longman, 1998

Solution Manual

Chapter 7, Problem 7.33

Membership in NP is obvious. We transform *Positive NAE3SAT* to our problem as follows. For each variable, x, in the original instance, we place one element in A; for each clause, c, we place one element also; in addition, A also includes an enforcer element, call it u; thus A has $m + n + 1$ elements. For each clause, $c = \{x, y, z\}$, we set up two triples, (x, c, y) and (c, u, z) in our transformed instance. This transformation is easily accomplished in polynomial time. Now, given a solution to the *Positive NAE3SAT* instance, we obtain a solution to our transformed instance by placing (in any order) the true variables on one "side" of u and the false variables on the other "side." If the first two variables of a clause have the same truth value, we place the clause element between these two variables in the order; if not, then we can place the clause element anywhere in the order. Conversely, a solution to our transformed instance yields a solution to *Positive NAE3SAT*: since c must be on the side opposite to z and yet between x and y, it follows that at least one of x or y must be on the side opposite to z, so that the clause has a not-all-equal assignment.