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Notes* III

RESPONSE TO "A NOTE ON 'THE FORMULATION OF THE *M*-SALESMAN TRAVELING SALESMAN PROBLEM' "†

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I wish to make two points clear: (i) the note correctly points out an error in the formulation, and (ii) the error is of no consequence with regard to the results of the paper.

With Regard to the Error. The note correctly shows that the inequalities (3) are not binding constraints for $m \geqslant 2$, since $y_i = 0\ \forall i$ satisfies the system. In a correct version, given in the note, inequalities (8) should be changed to (8a) to make them consistent with the notation of the paper (i.e., the first m cities are the dummy home cities).

$$y_i - y_j + (n-m)x_{ij} \leqslant n - m - 1, \qquad i \neq j, \tag{8a}$$

$$i, j = 1, \ldots, r, \quad i, j \notin I_0, \quad I_0 = \{1, \ldots, m\}, \quad r = n + m - 1.$$

With Regard to the Results. The error does not affect the results of the study since Problem II was not solved, but only used to illustrate that the number of implicitly imposed constraints in the multiple salesman problem is proportionally less than the number of implicitly imposed constraints in a one salesman problem of the same dimension.

The branch and bound algorithm explicitly solves sequences of pure assignment problems (1), (2), and (4) while the branching scheme implicitly excludes any solution which consists of *infeasible* subtours. Hence, the problem solved by the branch and bound algorithm consists of (1), (2), (4), and a set of loop constraints, stated as (3a).

(3a) the solution is either a tour or a set of feasible subtours. In a one salesman problem, the concept of feasible subtours does not exist, so the branching must generally continue whenever a subtour solution to (1), (2), and (4) is encountered.

* All Notes are refereed.

† Processed by Professor Morton Klein, Departmental Editor for Network Flows and Location Analysis; received April 28, 1975.