

**HYBRIDIZED METHOD TO SOLVE THE INTEGRATED PROBLEM OF
VEHICLE ROUTING AND SCHEDULING AT THE COLLECTION CENTER**

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The vehicle routing and vehicle scheduling problems are two of the well-studied problems in the field of Operations Research. Most of the operations in these two problems are inter-related at a collection centre in a supply chain. Therefore, the proper coordination among these inter-related operations is essential to increase the efficiency of the supply chain. This study is an extended work on the Mixed Integer Quadratic Programming (MIQP) model developed to solve the integrated Vehicle Routing and Scheduling Problems (VRSP). In this study, the Genetic Algorithm (GA) and GA-based hybridized (HGA) method were proposed to solve the large-scale instances of VRSP. The objectives of this study were to test the accuracy of the proposed GA and to recommend a better method among GA and HGA based on the competency of their solutions. In the HGA, the GA was hybridized with the 'reversion local search method'. For the computational experiments on the MIQP, the benchmark instances were used. The Relative Percentage Deviation (RPD) formula was used to compare the solutions obtained from the methods. The accuracy of the GA was tested by comparing its results with the exact optimal solution obtained using the Branch and Bound algorithm to the MIQP model for the VRSP. The results reveal that up to 91% accuracy in the optimal solution can be reached by the GA method, and it is more than 97% on average. The RPD values reveal that up to 21% improvement in the optimal solution can be obtained by the HGA compared to the GA. It can be concluded that, on average, more than 12% improvement in the quality of the solution can be reached by HGA than that of from GA. This study recommends that GA with reversion local search method produces highly accurate optimal solutions to the VRSP.

Keywords: Collection centre, Hybridized method, Vehicle routing, Vehicle scheduling