

## **Investigations on vehicle routing problem using a novel route grouping technique with variants of heuristic algorithms**

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Transportation is the only means by which goods can be transferred from one place to another. For any business to be profitable, transportation of raw materials to factories and delivery of goods from factory to customers must be done efficiently with low cost. This leads to the development of business and hence, automatically contributes to the development of a nation. Vehicle Routing Problem (VRP) is a class of transportation problems which is the main focus of this research. Single Depot Heterogeneous Vehicle Routing Problem with Time Windows (SD-HVRPTW) can be used to define transportation of commodity either as delivery from the depot to the customers dispersed around the depot or as pickup from the different customers to the central depot. Few vehicles have different characteristics and should start from the depot and end at the depot after servicing all the customers. The servicing of all the customers must be done within the time-windows specified by the customer. The major factor being considered by most of the papers is minimization of distance which is the summation of distance of all the vehicles put together. For a problem having less than five customers and five vehicles, exact algorithms provide the optimal solution. Exact algorithm is implemented by means of Mixed Integer Linear Programming using a LINGO set code. Benchmark instances with different count of customers and vehicles with their corresponding characteristics are provided as input. LINGO solver yields optimal solution with considerable time when the problem has less than five customers and five vehicles.