CHAPTER 7
DISCUSSIONS

This section discusses about the salient features of the four FCT models and the performance of the algorithms proposed for the above four FCT models.

FCT problems arise in a large number of production and transportation systems. The single-stage general FCT problem is an extension of the classical transportation problem in which a fixed cost is incurred for every supply point that is used in the solution and assumes shipment between a source and a destination is fulfilled as a single lot. The FCT problems are much more difficult to solve due to the presence of fixed costs, which cause discontinuities in the objective function and are known to be Non-Polynomial ‘NP’ hard.

In Supply Chain ‘SC’ networks, customers and their needs are the origin. The next stage of the SC is its distribution centres, which in turn, forward the needs of the customers to the manufacturers. In such problems, one of the strategic decisions is the allocation of transaction quantities from production centres to terminal points through distribution agents/centres in a cost effective manner. The single-stage FCT problem is involved with a single binary variable that specifies whether the product is transported from the supply point to the demand centres. However, in two-stage supply chain FCT problems, there are two binary variables, one each for each stage.
The other practical point, which is not addressed in general FCT, is the consideration to the capacity of the truck. In real world situations, the lot size may exceed the capacity of the truck and so the shipment has to be done with more than one trip. This leads to increase the fixed charge that is proportional to the number of trips made. Such circumstances, the optimal transportation plan would be different from the one that does not consider the capacity of the truck. The inclusion of the truck load constraint in FCT problem converts the binary variable to an integer variable.

Hence all the models considered are more complex than the general FCT and NP-hard.

The review of literature on related papers of GA from population based heuristics and SAA from neighbourhood based heuristics shows that they are proven tools for any type of NP hard problems. In the light of the above, this thesis considered GA and SAA as the tools to evolve optimal or near-optimal solution for all the four FCT models under study.

The performance of the proposed GA and SAA for the first and second FCT models are evaluated by comparing it with the approximate and lower bound solutions. The capability of the proposed GA and SAA for the third and fourth FCT models are analysed by comparing it with the approximate and lower bound solutions under relaxed truck load capacity. In each FCT models, twenty sample problems are considered for the performance comparison. Thus, the comparison reveals that the GA and SAA generates better solution than the approximation method and are capable of providing solution either equal or closer to the lower bound solution of the problem. Besides, the single-stage and two-stage TLC-FCT models are analysed with varying truck capacities. The result assures that increase in the truck capacity leads to decrease in the number of trips and hence the total cost of transportation. It further reveals that the total cost of transportation is same for the truck capacities greater than the maximum of supply and demand.