ABSTRACT

The multi-period fixed charge problem is an extension of the multi-period distribution problem ‘MPDP’ and general fixed charge transportation ‘FCT’ problem, where the time based decisions on the size of the shipments, simultaneous consideration of both suppliers’ and customers’ inventories and backorders/subcontracts can make an economical distribution. The conventional transportation problem considers only per unit cost of transportation. The other that has wide acceptance is FCT problem. Two kinds of cost are considered in the FCT: (i) a continuous cost that linearly increases with the amount transported between a source and a destination (ii) a fixed charge, which is incurred whenever a non-zero quantity is transported. The MPDP and FCT problems continue to be an active area of distribution research. Concerning the above, this thesis addresses four multi-period fixed charge models. They are:

**Model – 1:** Multi-period fixed charge distribution problem ‘MPFCDP’ associated with backorder and inventories.

**Model – 2:** Multi-period fixed charge distribution problem ‘MPFCDP’ associated with subcontract and inventories.

**Model – 3:** Multi-period fixed charge production-distribution problem ‘MPFCPDP’ associated with backorder and inventories.
**Model – 4:** Multi-period fixed charge production-distribution problem ‘MPFCPDP’ associated with subcontract and inventories.

The MPDP problems along with fixed charge are difficult to solve due to the presence of fixed cost, which cause nonlinearities in the objective function and are known to be Non-deterministic Polynomial-time ‘NP’ hard. The complexity of the problem is further increased, when time dependent backorders/subcontracts and inventories are included in the model. This limits the usage of the conventional FCT solution procedures.

In recent years, problem specific simple heuristic algorithm, neighbourhood search based Simulated Annealing Algorithm ‘SAA’ and population search based Genetic Algorithm ‘GA’ and have been increasingly applied to various search and optimization problems and have emerged as potential techniques to provide solutions with acceptable accuracy for NP-hard problems. In the light of the above consideration, this thesis proposes Equivalent Variable Cost ‘EVC’ heuristic from simple problem specific heuristics, SAA from neighbourhood search based heuristics and GA from population search based heuristics to solve the above four multi-period fixed charge models to minimize the total cost. The proposed heuristics are evaluated for their solution quality by comparing them with lower bound value and LINGO solutions. The comparison reveals that the proposed SAA and GA generate better solutions than the EVC heuristic solutions and are capable of providing solution either equal or close to the lower bound value and optimal solution of the problems.