

# Abstract

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## **Joint Replenishment Problem for Multi -Echelon System with Planned Shortage**

An inventory system with one warehouse and one retailer is proposed, planned shortage inventory amounts are allowed at both the retailer and the warehouse. During the ordering process, a major order cost for the lot is incurred and a minor order cost is added for each item in the lot. Demand occurs only at the retailer with constant deterministic rate. Two policies are considered for this problem first, the centralized non-cooperative policy where a centralized decision making process is done on warehouse and retailer together to optimize their costs second, the centralized cooperative policy where in addition to the centralized decision process, the items at the retailer and the warehouse are replenished jointly to gain the advantage of reducing the major order cost. The objectives here are to evaluate the optimum order interval ( $T_i$ ) for each item ( $i$ ) for the first policy, while in the second policy to determine the common order interval ( $T$ ) and the associated multiple integer( $k_i$ ) that determines the time of order for each item ( $i$ ). In addition, to find optimum inventory planned shortage amounts, for each item at each location, which minimize the total inventory cost for the echelon system.