**Question 5**

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**First, we need to transform the problem into a graph. We need to map all the warehouses into vertices. Because the deliveries occur on different days, we need to make copies of the warehouse’s vertices. Arrange them in order. For example, Day1: W1, W2, W3 as one column, Day2: W1, W2, W3 as another column, etc.**

**Then connect the vertices of the warehouses of the first day with source. The capacity of these edges is the number of items that each warehouse has at the beginning. Then connect the vertices of each warehouse of the th day to sink. The capacity of these edges is the items that needed by the end of the th day.**

**Moreover, the vertices of the same warehouse on adjacent days are also to be connected to each other, with no limit on the capacity of their edges.**

**Next, consider the case of deliveries: if a delivery is sent from to on day and arrives on day . Let the vertex of on day and the vertex of on day be connected by an edge, whose capacity is .**

**We end up with a graph that looks like this.**

**图示

描述已自动生成**

**Then we run the Edmonds Karp algorithm on this graph to find the maximum flow. If the maximum flow obtained is equal to the sum of all the together it is possible to have at least items present at each warehouse at the end of the th day, if not then it is impossible.**

**Transforming the problem into a graph takes time complexity.**

**Then the time complexity of running the Edmonds-Karp algorithm is . Therefore, the total time complexity of this algorithm is , which meets the polynomial time requirement of the question.**