The objective function aims to minimize T, which is the total time taken by the truck to complete its route, including both travel time between nodes and the initial departure time.

**Explanation of Variables:**

* **T**: The total travel time that the truck will take to complete all deliveries and return to the base.
* **t0​**: The **departure time**. This represents the initial starting time of the truck from the base.
* **tij(ti):** The **travel time** on the edge (i.e., road) between points i and j. This time **depends on the departure time ti​**, which can change due to traffic conditions. For example, during peak hours, ti could be higher.
* **xij ​**: A **binary decision variable** that equals 1 if the truck travels from point i to point j, and 0 otherwise. This decision variable indicates which route is taken.

**Additional Constraints:**

**1) Forbidden Loop:**

This constraint prevents the truck from **looping back to the same node**. In simpler terms, it means that the truck is **not allowed to return to the same point immediately** after leaving it. The expression :

 assigns an **infinite cost** to traveling from node i back to itself, making this path **impossible**.

**Mathematical Representation**:

Une image contenant Police, Graphique, noir, blanc

Description générée automatiquement

This means the truck cannot travel from a node i to the same node i. There is no loop allowed in the path.

**2) Infinite truck capacity:**

This constraint represents the **maximum capacity** of the truck. The truck cannot carry more than a certain volume or weight of goods. Mathematically, this can be written as:

Une image contenant Police, écriture manuscrite, Graphique, typographie

Description générée automatiquement

**Explanation**:

* qj​: The **quantity** of goods to be delivered to point j (this could be volume or weight).
* xj​: A binary decision variable that equals 1 if the truck visits point j, and 0 otherwise.
* The sum represents the **total amount** of goods being transported by the truck, and this must be **less than or equal to** the maximum capacity of the truck.
* Since in our case, the truck has **infinite capacity**, this constraint is relaxed or omitted.

**3) Hamiltonian Cycle:**

A Hamiltonian cycle ensures that the truck visits **each node exactly once** before returning to the base. The condition you're describing represents the fact that the truck must leave every node only once and visit every node once.

* **Mathematical Representation**:

Une image contenant Police, horloge, texte, Graphique

Description générée automatiquement

* This condition ensures that for every pair of nodes i and j, **there is exactly one trip** between them in one direction. This ensures that the truck does not revisit nodes and forms a complete Hamiltonian cycle.