MODULE 1:

PACKAGE DELIVERY SYSTEM

PROBLEM STATEMENT:

X person is a delivery boy. Every day he has a number of deliveries which are to be completed. X person lives in Y city – a city, consisting of **N** junctions, and **M** roads connecting these junctions. More precisely, the **i**th road connects the junctions with the numbers **Xi** and **Yi**. Each of these roads has its own (positive) length **Zi**, and no road connects a junction to itself. There are **K** delivery orders for X person. Each order is denoted with **four** integers: **Aj**, **Bj**, **Vj,** and **Cj**. It means that for the **j**th order X person has to pick a parcel of weight **Vj** at the junction numbered **Aj** and deliver it to the junction numbered **Bj**. After the parcel is delivered, X person gets a **Cj** burlesque reward. X person can’t complete the same order twice or more times.

The day of the X person starts as follows:

X person remembers the whole list of orders and starts at his initial junction numbered **S**. Then, he travels the streets of the city via his bike. If X person visits a junction, where there are one or more orders available he can either take some of the orders and load the corresponding parcels on his bike or not take anything now but do it later if he appears at the same junction again. When X person visits a junction which is the destination for some of the parcels that are currently with him, he can complete these orders and unload the corresponding parcels. Sadly, X person is not infinitely strong. Though he can carry any number of parcels at once if the total weight of the parcels exceeds **W** X person won’t be able to carry them on his bike. He also can't take a parcel and not deliver it because there will be complaints, hurting his reputation. The bike has enough fuel to travel only for **D** units of distance. It is not necessary for X person to get back to his initial junction because he has a lot of friends in Y city who will drop him back after the party (Sorry, you're not invited). It is clear that under the given constraints, might be not able to deliver all the parcels. So the task is to plan the delivery in such a way for X person that and they are categorized as high level and low-level requirements:

These are some of the **High-level requirements**:

* X person moves only by streets.
* The total distance doesn’t exceed **D.**
* The most important: the profit Mohan Kumar gets by the end of the day is maximized. You don't have to find the optimal delivery, but the more profit there is, the more are points you'll get.

Some of the **low-level requirements** of the planning of the delivery are:

* At any time, X person does not carry more than **W** units of weight.
* There are no undelivered parcels with X person by the end of delivery. In other words, all the parcels that X person has picked up should be delivered.