REPORT TO BOSS

(Xinqian Wang s4565489/Ziyi Liu 45655335)

Formulation

SETS

T sets of the trucks for every FSD

D sets of target islands DDP

F sets of teansfer islands FSD

DATA

Demand_d	d∈D	the demend goods(t) for island
DF_{fd}	f∈F d∈D	the price of transportation from DDP to FSD
FC_f	f∈F	the price of transportation from CDRD to FSD
Cost		the price of goods
TruckCost		the price of a truck to be allocated to a FSD
TruckCapacity		the units of a truck's limitation to transport

VARUABLE

X_{fd}		units of goods from FSD to DDP f∈F d∈D
Y_f		1 or 0, If the FSD f is chosen to transport or not f∈F
Z_{fd}		times of trips to transport from FSD to DDP f∈F d∈D
P_{fd}		units of goods are empty form the last trips from FSD to DDP f∈F d∈D
Q_f		times from CDRD to FSD f∈F
TB_{ft}		1 or 0, If the truck t from FSD f is exist or not f∈F t∈T
TK_{ft}		minutes for truck t from FSD f to spend during whole trips f∈F t∈T
TN_f		number for trucks in FSD f f∈F
TT_{ftd}		minutes for truck t from FSD f to DDPd f∈F t∈T d∈D

OBJECTIVE FUNCTIONS

$$\text{Minimize } (\sum_{f\in F,d\in D} Z_{fd} * TruckCapacity * DF_{fd} + \sum_{f\in F,d\in D} Cost * X_{fd} + \sum_{f\in F} Q_f * FC_f * TruckCapacity + \sum_{f\in F} TN_f * TruckCost \ )$$

CONSTRAINS

$$\sum_{d\in D,f\in F} X_{fd} * Y_f \geq Demand_d$$

$$\sum_{f\in F,d\in D} X_{fd} * Y_f \leq 820$$

$$\sum_{f\in F} Y_f \leq 5$$

$$\sum_{f\in[5,6,7,8]} Y_f \leq 1$$

$$TruckCapacity * Z_{fd} - X_{fd} = P_{fd} \ f \in F, d \in D$$

$$TruckCapacity \geq P_{fd} \geq 0 \ \ f \in F, d \in D$$

$$TruckCapacity \geq TruckCapacity * Q_f - \sum_{f\in F,d\in D} X_{fd} \geq 0 \ f \in F$$

$$\sum_{f\in F,t\in T} TB_{ft} \geq Y_f \ f \in F$$

$$\sum_{f\in F,t\in T} TB_{ft} = TN_f \ f \in F$$

$$\sum_{f\in F,t\in T} TB_{ft} \leq 6$$

$$\sum_{f\in F,d\in D} Z_{fd} * 3 * DF_{fd} \leq \sum_{f\in F,t\in T} TB_{ft} * TK_{ft}$$

$$TK_{ft} \leq 720 \ \ f \in F, t \in T$$

$$Z_{fd} = \sum_{f\in F,d\in D,t\in T} TT_{ftd} * TB_{ft} \ \ f \in F, d \in D$$

$$TK_{ft} = \sum_{f\in F,t\in T,d\in D} TT_{ftd} * 3 * DF_{fd} \ \ f \in F, t \in T$$

Code

Can be found in the python file. Communication 8 constrain will not be included at here.

The answer for communication 5 is $399307.

The answer for communication 6 is $404549.

The answer for communication 7 is $419928.

The answer for communication 8 is $660168.

The answer for communication 9 is $561728.