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IE 310 – GAMS Project

In our project we read the values from the inputs and assign them to the parameters we defined below. Inputs are taken from the textfiles in datafiles.rar

Our parameters

a(j,jp) clusterability : It takes two parameters (j and jp) from the file clusterability.txt.

dv(j) demand-volume : This parameter holds demand volumes as parameter j, reads from demand-volume.txt

dw(j) demand-weight : This parameter also holds demand weight as parameter j, reads from demand-weight.txt

CM(k) cost_multiplier : Cost multiplier parameter "k" . Initially set as small = 125, large =250

u(j) trans_cost : Transportation cost parameter u takes input as j, reads from trans_cost.txt

q(k) truck_capacity : This parameter holds truck capacities. It is initially given as small = 18 , large = 33 in project description.

Sets

j : Customers

k : truck_type (small, large)

n : truck_number (1*6), n can be increased but optimal is achieved at n=6

Our decision variables

x(j,k,n): Binary variable, x=1 if customer j is served by direct transs. using truck type k and truck number n. x=0 otherwise.

y(j): Binary variable, y=1 if cumstomer j is served by indirect transs. y=0 otherwise.

z(k,n): Positive variable, maximum cost of shipment in the nth truck type k

V(k,n): Integer variable, V gets a value if the shipment is direct. The value V = (# of customers by truck n in type k are served)-1

Our objective function is obj total cost, we are trying to minimize the total cost with respect to optimal choices of direct or indirect delivery times.

Constarints

one(j): Each customer should be served either by direct or indirect transshipment.

two(n,k): Capacity constraint for direct transs.

three(n,k,j): Max of the direct cost of a shipment for a given truck.

four(k,n): Maksimum of 3 customers can be served by a given truck.

five(j,jp,k,n): clusterability conservation.

six(k,n): Equation of V which gets a value if the shipment is direct.

The value V = (# of customers by truck n in type k are served)-1

Our constarints work collaborately as follows

*cost .. obj =e= sum((k,n),z(k,n)+ CM(k)*V(k,n)) + sum(j, y(j)*dw(j)*u(j))* : Objective function sums up all the parameters. We have declared above. Max cost shipment + cost multipler x other shipment number + (binary variable for indirect shipment x demand weight x transportation cost)

one(j) .. sum((k,n),x(j,k,n))+y(j)=e=1 : To holds the situation that each customers should be served either direct or indirect transshipment sum of x(x=1 if customer j is served by direct transs. using truck type k and truck number n) and y(y=1 if cumstomer j is served by indirect transs) should be equal to one.

*two(n,k) .. sum(j, x(j,k,n)*dv(j))=l=q(k)* : Sum of x(binary variable for direct transshipment) * dv(demand value) should be equal to truck capacity.

*three(n,k,j).. x(j,k,n)*c(j,k)=l=z(k,n)* : maximum cost of shipment in the nth truck type must not be exceeded.

four(k,n) .. sum(j,x(j,k,n))=l=3 : At most three customers can perform direct shipment *five(j,jp,k,n).. x(j,k,n)+x(jp,k,n)=l=a(j,jp)+1* : Clusterability constraint must be hold for all customers

six(k,n).. (sum(j,x(j,k,n)))-1 =l= V(k,n) : Total number of customers by truck n in type k are served -1 must be equal to other shipment number

Final remark

According to our execution results;

Our program works with mip solution of 15891.522012 with 2280651 iterations, 101520 nodes.

Best possible: 13682.869828

Absolute gap: 2208.652184

Relative gap: 0.138983

The result of equation six shows us no large truck is used for direct shipment and six small trucks were used for direct shipment.