MATHEMATICAL MODEL

Parameters of the study;

* *cij*: the distance of traveling from node *i* to node *j* with vehicle k *i*=1,..,n , *j*=1,..,n
* *di*: the demand of customer *i, i* = 1,2,...,n
* *tij*: the travel time along arc(*i,j)*.
* *si*: the service time of customer *i* need.
* *q*: the capacity of the vehicle *k*.
* *M1*: 2*.n.*
* *M2*: *l0*.
* [*li,ui*] : desired, preferred time window for the customer *i* to be serviced.

Decision variables of the study:

* Flow variable : *xijk*: 1, if arc(*i,j*) is used by vehicle *k*, o/w 0.
* Time variable : *wik*: the starting time of service of vehicle *k* at customer *i*.

Model:

*ij* ∗ *ijk* + *1*  *0jk  (1)*

*ijk*  *, i  (2)*

*0,j,k  , k  (3)*

*ijk - jik  0 , k  , j (4)*

*i,n+1,k  , k  (5)*

*i ijk  k , k  (6)*

*ik + i + ij – 2 ijk jk, k  , j* *(7)*

*i ik  i , (8)*

*ijk  , k ∈ K, (i, j) ∈ A* *(9)*