INF273 – Assignment #3

Implement a Local Search, and a Simulated Annealing algorithm to solve a pickup and delivery problem with time windows.

- Work with the same six instances you used in assignment #2
- You should implement the following algorithms, run them 10 times for each instance and report six tables (one for each problem instance) in the given format
- Start with an initial solution that every call is outsourced
- You should also report the best-found solution for each instance (in the same format as it has been discussed in the class and is available on the lecture slides). For each instance, only report the best solution you get from the six different algorithm setups.
- You should use *1-reinsert, 2-exchange,* and *3-exchange* heuristics as operators.

Instance name (e.g. Call_7_Vehicle_3)				
	Average objective	Best objective	Improvement (%)	Running time in seconds
Random Search	Copy from A#2	Copy from A#2	Copy from A#2	Copy from A#2
Local Search-1-insert				
Local Search-2-exchange				
Local Search-3-exchange				
Simulated Annealing-1-insert				
Simulated Annealing-2-exchange				
Simulated Annealing-3-exchange				

Local search (modified for assignment #3)

Input: initial solution (s_0),
Input: neighborhood operators: *2-exchange*, *3-exchange*, or *1-reinsert*
Input: evaluation function f, $f(s) \longrightarrow$ the cost of s
$BestSolution \Leftarrow s_0$
for iteration = 1 to 10000
    $NewSolution \Leftarrow$ Operator ($BestSolution$)
    if $NewSolution$ is feasible and $f(NewSolution) < f(BestSolution)$ then
        $BestSolution \Leftarrow NewSolution$
    end if
end for

Simulated Annealing (modified for assignment #3)

Input: initial solution (s_0),
Input: neighborhood operators: *2-exchange*, *3-exchange*, or *1-reinsert*
Parameters: T_f (final temperature) = 0.1
Input: evaluation function f, $f(s) \longrightarrow$ the cost of s
$Incumbent \Leftarrow s_0$, $BestSolution \Leftarrow s_0$
for w = 1 to 100
    $NewSolution \Leftarrow$ Operator ($Incumbent$)
    $\Delta E \Leftarrow f(NewSolution) - f(Incumbent)$
    if $NewSolution$ is feasible and $\Delta E < 0$ then
        $Incumbent \Leftarrow NewSolution$
        if $f(Incumbent) < f(BestSolution)$ then
            $BestSolution \Leftarrow Incumbent$
        end if
    elseif $NewSolution$ is feasible
        if $Rand < 0.8$ then
            $Incumbent \Leftarrow NewSolution$
        end if
        $\Delta_w \Leftarrow \Delta E$
    end if
end for
DeltaAvg = mean (Δ_w)
$T_0 = \frac{-\text{DeltaAvg}}{\ln(0.8)}$, $\alpha = \sqrt[9900]{T_f / T_0}$
$T \Leftarrow T_0$
for iteration = 1 to 9900
    $NewSolution \Leftarrow$ Operator ($Incumbent$)
    $\Delta E \Leftarrow f(NewSolution) - f(Incumbent)$
    if $NewSolution$ is feasible and $\Delta E < 0$ then
        $Incumbent \Leftarrow NewSolution$
        if $f(Incumbent) < f(BestSolution)$ then
            $BestSolution \Leftarrow Incumbent$
        end if
    elseif $NewSolution$ is feasible and $Rand < p = e^{\frac{-\Delta E}{T}}$
        $Incumbent \Leftarrow NewSolution$
    end if
    $T = \alpha * T$
end for