Instance	Model			Column Generation		
	Cont. relax.	**Optimum**	**Time**	**Obj. Function**	**Time**	**# columns**
i_10_1	2.63636	3	0.03264	2.66667	0.359967	26
i_10_2	4.3	5	0.018411	4.5	0.278071	25
i_10_3	2.90476	3	0.058427	3	0.536628	32
i_15_1	2.90909	3	0.022351	2.90909	1.77	41
i_15_2	4.38235	5	0.029576	4.38462	1.65367	46
i_20_1	4.8571	5	0.146426	4.8571	3.32797	58
i_40_1	11.1277	12	0.116569	11.1277	9.54254	131

- The column generation scheme is able to provide a LB that is at least the one provided by the continuous relaxation, for all instances of this problem.

Instance	Surrogate Relaxation			Cover			
	Value LB/ UB	**Time**	**# iterations**	**Initial obj function**	**Final obj function**	**time**	**# covers**
i_10_1	3/3	0.075576	4	2.63636	2.63636	2.82545	3
i_10_2	5/10	34.0572	324	4.3	4.3	10.6873	30
i_10_3	3/10	7.81246	202	2.90476	2.90476	4.8206	9
i_15_1	3/3	0.054444	3	2.90909	2.90909	9.52707	13
i_15_2	5/5	4.48911	44	4.38235	4.38235	9.31311	24
i_20_1	5/20	46.6365	202	4.85714	4.85714	2.91635	0
i_40_1	12/12	65.4841	21	11.1277	11.1277	207.074	170

- The surrogate relaxation was solved with a maximum of 1000 iterations but with a stopping condition that is called “early stopping”: after 200 iterations where the solution was not improved, the algorithm stops.

- The surrogate relaxation was able to prove the optimality of the LB for i_10_1, i_15_1, i_15_2, i_40_1. Changes in how we update the step were not able to improve those upper bounds.

- Cover inequalities were searched for all the capacity constraints of the problem but none of them was able to improve the LB provided by the linear relaxation.

Instance	Constructive			Improving			
	Obj. function	**Gap**	**Time**	**Obj. Function**	**Gap**	**Time**	**# iterations**
i_10_1	3	0	0	3	0	0.030737	1
i_10_2	5	0	0.001208	5	0	0.032327	1
i_10_3	4	0.25	0.000714	3	0	0.055862	2
i_15_1	3	0	0	3	0	0.028678	1
i_15_2	5	0	0	5	0	0.031234	1
i_20_1	6	0.17	0.001581	5	0	0.178195	2
i_40_1	12	0	0	12	0	0.135177	1

- gap computed with the formula:

$$GAP = \frac{UB - LB}{UB}$$

  where as LB we considered the bounds from surrogate relaxation in point 3.

- The k-opt local search improved the greedy solution only in instances i_10_3 and i_20_1, and it did it in a reasonable time and with a low number of iterations.

- The local search was able to reach the optimal value in all the instances.