List of Tables

2.1 Average gap for (2.3)-(2.5) and for (2.25)-(2.26) 34

2.2 Average computational times for randomly generated problems with up to 15 nodes 42

2.3 Average computational times for randomly generated problems with 20 nodes 43

2.4 Average computational times for randomly generated problems with 30, 50 and 100 nodes 43

3.1 Heuristics-Exact problem of generating CG cuts 58

4.1 Average number of constraints generated while solving the Path-Based formulation F_1 and the Cumulative Probability formulation F_2. 78

4.2 Computational results for the methods in section 4.5. 79

4.3 Additional computational results for the Multicommodity Flow formulation F_3. 81

5.1 Gap for the heuristic H_1' 111

5.2 Average gap and computational times for the Delay-constrained Steiner Tree problem 112

5.3 Gap and computational times for the algorithm without the LP preprocessing 113

5.4 Degree-delay preprocessing reduction 114

5.5 Improvement of the lifted constraints (5.31) with respect to the unlifted constraints (5.30) 115

5.6 Computational time of the class B and C for the Steiner Tree problem 115