The values without any symbol correspond to the optimal values, the values marked with an asterisk ($*$) correspond to the best upper bound obtained with the branch-and-cut algorithm and the values marked with the symbol ^{H} were obtained with heuristics methods.

Best known upper bounds for the benchmark instances

Table 1: Best known upper bounds for the benchmark instances

Instance	Best known upper bound
burma14_1	13.93
burma14_2	25.66
burma14_3	11.89
bayg29_1	5345.89
bayg29_2	5791.01
bayg29_3	5544.33
att48_1	23686.00
att48_2	20609.10
att48_3	9024.58
bier127_1	33709.70
bier127_2	88736.40
bier127_3	47726.30
a280_1	1692.92^H
a280_2	1568.56^*
a280_3	1408.14
gr666_1	1531.93^H
gr666_2	1236.21^H
gr666_3	1225.61^H
pr1002_1	132821.40^H
pr1002_2	144543.77^H
pr1002_3	126282.93^H

Best known upper bounds for the generated instances based on symmetric TSP instances

Table 2: Best known upper bounds for the generated instances based on symmetric TSP instances

Instance	Best known upper bound
pr136_1	61448
Continues on the next page	

Table 2

Instance	Best known upper bound
pr136_2	43522
pr136_3	81481
pr136_4	63246
gr137_1	44263
gr137_2	36435
gr137_3	55919
gr137_4	46620
pr144_1	46376
pr144_2	36518
pr144_3	54635
pr144_4	49379^{H}
kroA150_1	14307
kroA150_2	9481
kroA150_3	20880^{*}
kroA150_4	13404
kroB150_1	14522
kroB150_2	9555
kroB150_3	19925
kroB150_4	12532
pr152_1	51806
pr152_2	45810
pr152_3	64425^{*}
pr152_4	57337
u159_1	29821
u159_2	23401
u159_3	36399
u159_4	30845
rat195_1	1285^{*}
rat195_2	912
rat195_3	1814^{*}
rat195_4	1320^{*}
d198_1	10945
d198_2	10212
d198_3	13843
d198_4	12418
kroA200_1	16441^{*}
kroA200_2	12416
kroA200_3	24471^{*}

Continues on the next page

Table 2

Instance	Best known upper bound
kroA200_4	16518
kroB200_1	17527
kroB200_2	12881
kroB200_3	24088*
kroB200_4	17583
gr202_1	23394
gr202_2	14957
gr202_3	34547
gr202_4	28039*
pr226_1	52109
pr226_2	47585
pr226_3	66812
pr226_4	51905
gr229_1	70741*
gr229_2	31653
gr229_3	102841
gr229_4	46231
gil262_1	1526^H
gil262_2	1069
gil262_3	1988^H
gil262_4	1671^H
pr264_1	33904
pr264_2	28748*
pr264_3	40705
pr264_4	35153

Best known upper bounds for the generated instances based on asymmetric TSP instances

Table 3: Best known upper bounds for the generated instances based on asymmetric TSP instances

Instance	Best known upper bound
br17_1	31
br17_2	28
Continues on the next page	

Table 3

Instance	Best known upper bound
br17_3	39
br17_4	36
ftv33_1	868
ftv33_2	401
ftv33_3	1286
ftv33_4	829
ftv35_1	1008
ftv35_2	530
ftv35_3	1232
ftv35_4	1008
ftv38_1	830
ftv38_2	392
ftv38_3	1449
ftv38_4	774
p43_1	5483
p43_2	5473
p43_3	5530
p43_4	5492
ftv44_1	996
ftv44_2	625
ftv44_3	1343
ftv44_4	998
ftv47_1	1179
ftv47_2	729
ftv47_3	1472
ftv47_4	1099
ry48p_1	10318
ry48p_2	6787
ry48p_3	12752
ry48p_4	10139
ft53_1	3572
ft53_2	2819
ft53_3	5972
ft53_4	4734
ftv55_1	570
ftv55_2	365
ftv55_3	1021
ftv55_4	579

Continues on the next page

Table 3

Instance	Best known upper bound
ftv64_1	977
ftv64_2	660
ftv64_3	1617
ftv64_4	1515
ft70_1	21226
ft70_2	15360
ft70_3	29573
ft70_4	26817
ftv70_1	849
ftv70_2	676
ftv70_3	1342
ftv70_4	1261
kro124p_1	25251
kro124p_2	12421
kro124p_3	32025
kro124p_4	18552
ftv170_1	1652
ftv170_2	1108
ftv170_3	2215
ftv170_4	1610
rbg323_1	337
rbg323_2	70
rbg323_3	822
rbg323_4	335
rbg358_1	209
rbg358_2	50
rbg358_3	658
rbg358_4	409
rbg403_1	345
rbg403_2	32
rbg403_3	1427
rbg403_4	486
rbg443_1	539
rbg443_2	350^H
rbg443_3	1353
rbg443_4	729

Best known upper bounds for the generated instances based on asymmetric UTPP instances

Table 4: Best known upper bounds for the generated instances based on asymmetric UTPP instances

Instance	Best known upper bound
AsimSingh50_1	438
AsimSingh50_2	211
AsimSingh50_3	694
AsimSingh50_4	367
AsimSingh100_1	1005
AsimSingh100_2	465
AsimSingh100_3	1350
AsimSingh100_4	705
AsimSingh150_1	1185
AsimSingh150_2	735
AsimSingh150_3	1770
AsimSingh150_4	885
AsimSingh200_1	1545
AsimSingh200_2	1050
AsimSingh200_3	2400
AsimSingh200_4	1455
AsimSingh250_1	2145
AsimSingh250_2	1200
AsimSingh250_3	3135
AsimSingh250_4	2445
AsimSingh300_1	2595
AsimSingh300_2	1605
AsimSingh300_3	3825
AsimSingh300_4	2655