

Mixed-Integer Nonlinear Optimization Problems: ANTIGONE 1.0 Test Suite

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This document outlines the test suite validating ANTIGONE 1.0. We document source files from both the academic literature and well-maintained websites, provide links to the modeling files in GAMS scalar format, and record the relative sizes of each of the problems.

To validate ANTIGONE, Table 1 defines a test suite of 2571 problems from standard libraries and the open literature; Tables 2 – 11 in Appendix A give more detailed analysis as to the size and complexity of the individual problems. The examples excluded from the standard test libraries are those which either include functional forms that the current ANTIGONE implementation cannot handle (*e.g.*, trigonometric, min/max, errorf) or have known feasible points where the objective value is minus infinity (plus infinity if MINLP is a maximization problem). Recall that the standard libraries are dynamic entities; we are using the latest versions as of 11 March 2013. The other test cases are from the open literature.

1 Test Cases from `minlp.org`

The models from `minlp.org` are documented in Table 10. As of 04 March 2013 there is a group of modeling files labeled *Test Set* on `minlp.org`; each modeling file may contain multiple MINLP problems and some modeling files require user input arguments. As it is unclear how to use the files labeled *Test Set*

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Table 1: MINLP Test Suite of 2571 Problems

Problem Class		# Cases	Discrete	Source
minlp. org	Belgian Chocolate Problem	4	✓	[19, 20]
	Cascading Tanks	8	✓	[26]
	Cyclic Scheduling and Control	1	✓	[23]
	Distillation Sep. Sequences	1	✓	[10, 11, 12, 13]
	Heat Exchanger Networks	3	✓	[22, 57]
	Metabolic Networks	2	✓	[28, 29]
	Multi-Product Batch Plants	2	✓	[27, 32, 59]
	Periodic Scheduling	13	✓	[14, 15]
	Pooling	19	✓	[42]
	Supply Chain Design	2	✓	[58, 60]
	Three-Echelon Supply Chain	8	✓	[46, 47, 61]
	Unit Commitment	2	✓	[45, 62]
	Water Distribution Network	8	✓	[7, 21]
	Water Treatment Network	18	✓	[2, 1, 31, 48]
	Crude Oil Scheduling	24	✓	[35, 43, 44]
MIQCQP	BoxQP	90		[8, 55, 56]
	Circles & Polygon Nesting	35		[30]
	Crude Oil Scheduling	7	✓	[36, 37]
	Multi-Period Blending	7	✓	[33, 34]
	Natural Gas Production	3	✓	[38, 39, 52]
	Point Packing	14		[4]
	QAP	67		[3, 40]
	Randomly-Generated QCQP	135		[5]
	Reform. GLOBALLib	32		[24, 41, 50]
	Reform. MINLPLib	10	✓	[9, 24]
	Standard QP	15		[51]
	Water Treatment System	32		[17, 18]
Water-Using Network	35		[16, 53, 54]	
Test Libraries	AMPL Book Lib	34		[25]
	Bonmin Test Set	134	✓	[6, 49]
	GLOBALLib	368		[24, 41]
	LINLib	39		
	MacMOOPLib	12		
	MPLLib	22		
	MINLPLib	249	✓	[9, 24]
PrincetonLib	1116			

on `minlp.org`, we have compiled a collection of problems from the `minlp.org` *MINLP Library*; Table 1 documents their origin.

1.1 4 Belgian Chocolate Problems

The Belgian Chocolate Problems represent stabilizing controller design [19, 20].

`bcp5 bcp6 bcp7 bcp8`

1.2 8 Cascading Tanks

The Cascading Tank test cases are in both MINLP and MPCC formulations [26].

<code>CascadingTanks_MINLP_1Tank_20FE</code>	<code>CascadingTanks_MINLP_1Tank_40FE</code>
<code>CascadingTanks_MINLP_3Tank_20FE</code>	<code>CascadingTanks_MINLP_3Tank_40FE</code>
<code>CascadingTanks_MPCC_1Tank_20FE</code>	<code>CascadingTanks_MPCC_1Tank_40FE</code>
<code>CascadingTanks_MPCC_3Tank_20FE</code>	<code>CascadingTanks_MPCC_3Tank_40FE</code>

1.3 1 Cyclic Scheduling and Control

The Cyclic Scheduling and Control test case applies to a multi-product continuous stirred-tank reactor [23].

`caso-1-sc-v2`

1.4 1 Distillation Separation Sequences

The Distillation Separation Sequence test case optimally integrates thermally-coupled distillation sequences [10, 11, 12, 13].

`Conventional`

1.5 3 Heat Exchanger Networks

These test cases simultaneously synthesize Heat Exchanger Networks [22, 57].

`Escobar_HEN1 Escobar_HEN2 Escobar_HEN3`

1.6 2 Metabolic Networks

The Metabolic Networks test cases identify metabolic pathways [28, 29].

`GMA_ethanol_model_BigM GMA_ethanol_model_CH`

1.7 2 Multi-Product Batch Plants

These test cases are for the optimal design of multi-product batch plants [27, 32, 59].

batch_plant_nonconvex1 batch_plant_nonconvex2

1.8 7 Periodic Scheduling

The Periodic Scheduling test cases are for continuous multiproduct plants [14, 15].

MTG_EX1 MTG_EX2 MTG_EX5 MTG_EX6
STG_EX1 STG_EX5 STG_EX6

1.9 19 Pooling

The pooling problems represent blending under the conditions of intermediate storage [42].

adhya1 adhya2 adhya3 adhya4 bental4
bental5 foulds2 foulds3 foulds4 foulds5
haverly1 haverly2 haverly3 lee1 lee2
meyer04 meyer10 meyer15 rt2

1.10 2 Supply Chain Design

Multi-echelon supply chain design is for inventories under uncertainty [58, 60].

you_supply_chain_design_1 you_supply_chain_design_2

1.11 8 Three-Echelon Supply Chain

The Three-Echelon Supply Chain examples are optimally designed under uncertainty [46, 47, 61].

ngw-r1-22020 ngw-r1-236 ngw-r1-3510 ngw-r1-53050
ngw-you-22020 ngw-you-236 ngw-you-33050 ngw-you-3510

1.12 2 Unit Commitment

The two unit commitment models minimize operating costs on a network of power generators [45, 62].

zondervan_UC_convex zondervan_UC_nonconvex

1.13 8 Water Distribution Network

These test cases are for the optimal design of water distribution networks [7, 21].

wdn-signvar_blacksburg	wdn-signvar_foss_iron
wdn-signvar_foss_poly-0	wdn-signvar_foss_poly-1
wdn-signvar_hanoi	wdn-signvar_modena
wdn-signvar_pescara	wdn-signvar_shamir

1.14 16 Water Treatment Network [1, 2, 31, 48]

ahmetovic.Ex1.NoEps	ahmetovic.Ex1.WithEps
ahmetovic.Ex2.NoEps	ahmetovic.Ex2.WithEps
concbased	Ex1b-WaterNetwokProblem-WOEps_pw4
Ex_2__WaterNetwokProblem-NoEps_	flowbased_pw4
kg_example1	kg_example2_pw4
kg_example3_pw4	kg_example4_pw4
ruiz_concbased	ruiz_flowbased
smith_sahinidis_M1	TCD_MINLPorg

1.15 24 Crude Oil Scheduling

The crude oil scheduling test cases are for unloading with inventory management [35, 43, 44].

Scheduler_LeeCrudeOil1.05	Scheduler_LeeCrudeOil1.06
Scheduler_LeeCrudeOil1.07	Scheduler_LeeCrudeOil1.08
Scheduler_LeeCrudeOil1.09	Scheduler_LeeCrudeOil1.10
Scheduler_LeeCrudeOil2.05	Scheduler_LeeCrudeOil2.06
Scheduler_LeeCrudeOil2.07	Scheduler_LeeCrudeOil2.08
Scheduler_LeeCrudeOil2.09	Scheduler_LeeCrudeOil2.10
Scheduler_LeeCrudeOil3.05	Scheduler_LeeCrudeOil3.06
Scheduler_LeeCrudeOil3.07	Scheduler_LeeCrudeOil3.08
Scheduler_LeeCrudeOil3.09	Scheduler_LeeCrudeOil3.10
Scheduler_LeeCrudeOil4.05	Scheduler_LeeCrudeOil4.06
Scheduler_LeeCrudeOil4.07	Scheduler_LeeCrudeOil4.08
Scheduler_LeeCrudeOil4.09	Scheduler_LeeCrudeOil4.10

2 Mixed-Integer Quadratically-Constrained Quadratic Programs

The mixed-integer quadratically-constrained quadratic programs are documented in Table 11.

2.1 90 Box-Constrained Quadratic Programs (BoxQP) [8, 55, 56]

spar020-100-1 spar020-100-2 spar020-100-3
spar030-060-1 spar030-060-2 spar030-060-3
spar030-070-1 spar030-070-2 spar030-070-3
spar030-080-1 spar030-080-2 spar030-080-3
spar030-090-1 spar030-090-2 spar030-090-3
spar030-100-1 spar030-100-2 spar030-100-3
spar040-030-1 spar040-030-2 spar040-030-3
spar040-040-1 spar040-040-2 spar040-040-3
spar040-050-1 spar040-050-2 spar040-050-3
spar040-060-1 spar040-060-2 spar040-060-3
spar040-070-1 spar040-070-2 spar040-070-3
spar040-080-1 spar040-080-2 spar040-080-3
spar040-090-1 spar040-090-2 spar040-090-3
spar040-100-1 spar040-100-2 spar040-100-3
spar050-030-1 spar050-030-2 spar050-030-3
spar050-040-1 spar050-040-2 spar050-040-3
spar050-050-1 spar050-050-2 spar050-050-3
spar060-020-1 spar060-020-2 spar060-020-3
spar070-025-1 spar070-025-2 spar070-025-3
spar070-050-1 spar070-050-2 spar070-050-3
spar070-075-1 spar070-075-2 spar070-075-3
spar080-025-1 spar080-025-2 spar080-025-3
spar080-050-1 spar080-050-2 spar080-050-3
spar080-075-1 spar080-075-2 spar080-075-3
spar090-025-1 spar090-025-2 spar090-025-3
spar090-050-1 spar090-050-2 spar090-050-3
spar090-075-1 spar090-075-2 spar090-075-3
spar100-025-1 spar100-025-2 spar100-025-3
spar100-050-1 spar100-050-2 spar100-050-3
spar100-075-1 spar100-075-2 spar100-075-3

2.2 35 Circles & Polygon Nesting [30]

kall_circles_c6a	kall_circles_c6b
kall_circles_c6c	kall_circles_c7a
kall_circles_c8a	kall_circlespolygons_c1p11
kall_circlespolygons_c1p12	kall_circlespolygons_c1p13
kall_circlespolygons_c1p5a	kall_circlespolygons_c1p5b
kall_circlespolygons_c1p6a	kall_circlesrectangles_c1r11
kall_circlesrectangles_c1r12	kall_circlesrectangles_c1r13
kall_circlesrectangles_c6r1	kall_circlesrectangles_c6r29
kall_circlesrectangles_c6r39	kall_congruentcircles_c31
kall_congruentcircles_c32	kall_congruentcircles_c41
kall_congruentcircles_c42	kall_congruentcircles_c51
kall_congruentcircles_c52	kall_congruentcircles_c61
kall_congruentcircles_c62	kall_congruentcircles_c63
kall_congruentcircles_c71	kall_congruentcircles_c72
kall_diffcircles_10	kall_diffcircles_5a
kall_diffcircles_5b	kall_diffcircles_6
kall_diffcircles_7	kall_diffcircles_8
kall_diffcircles_9	

2.3 7 Crude Oil Scheduling [36, 37]

ex01 ex02 ex03 ex05 ex06 ex11 ex21

2.4 7 Multi-Period Blending [33, 34]

MPBP_6T_3P_2Q_029 MPBP_8T_3P_2Q_146 MPBP_8T_3P_2Q_718
MPBP_8T_3P_2Q_721 MPBP_8T_4P_2Q_480 MPBP_8T_4P_2Q_531
MPBP_8T_4P_2Q_852

2.5 3 Natural Gas Production [38, 39, 52]

Sarawak_Scenario1 Sarawak_Scenario16 Sarawak_Scenario81

2.6 14 Point Packing [4]

pnt_pack_02 pnt_pack_03 pnt_pack_04 pnt_pack_05
pnt_pack_06 pnt_pack_07 pnt_pack_08 pnt_pack_09
pnt_pack_10 pnt_pack_11 pnt_pack_12 pnt_pack_13
pnt_pack_14 pnt_pack_15

2.7 67 Quadratic Assignment Problems (QAP) [3, 40]

bur26a bur26b bur26e bur26f bur26g bur26h chr12a
chr12b chr12c chr15a chr15b chr15c chr18a chr18b
chr20a chr20b chr20c chr22a chr22b chr25a esc16b
esc16c esc16d esc16e esc16g esc16h esc32a esc32b
had12 had14 had16 had18 had20 kra32 nug05
nug06 nug07 nug08 nug10 nug12 nug14 nug15
nug16a nug16b nug17 nug18 nug20 nug21 nug22
nug24 nug25 nug27 nug28 rou12 rou15 rou20
scr12 scr15 tai10a tai12a tai15a tai17a tai20a
tai25a tai30a tai35a wil50

2.8 135 Randomly-Generated QCQP [5]

unitbox_c_10_10_1_100 unitbox_c_10_10_1_50 unitbox_c_10_10_2_100
unitbox_c_10_10_2_50 unitbox_c_10_10_3_100 unitbox_c_10_10_3_50
unitbox_c_10_15_1_100 unitbox_c_10_15_1_50 unitbox_c_10_15_2_100
unitbox_c_10_15_2_50 unitbox_c_10_15_3_100 unitbox_c_10_15_3_50
unitbox_c_10_20_1_100 unitbox_c_10_20_1_50 unitbox_c_10_20_2_100
unitbox_c_10_20_2_50 unitbox_c_10_20_3_100 unitbox_c_10_20_3_50
unitbox_c_20_20_1_100 unitbox_c_20_20_1_25 unitbox_c_20_20_1_50
unitbox_c_20_20_2_100 unitbox_c_20_20_2_25 unitbox_c_20_20_2_50
unitbox_c_20_20_3_100 unitbox_c_20_20_3_25 unitbox_c_20_20_3_50
unitbox_c_20_30_1_100 unitbox_c_20_30_1_25 unitbox_c_20_30_1_50
unitbox_c_20_30_2_100 unitbox_c_20_30_2_25 unitbox_c_20_30_2_50
unitbox_c_20_30_3_100 unitbox_c_20_30_3_25 unitbox_c_20_30_3_50
unitbox_c_20_40_1_100 unitbox_c_20_40_1_25 unitbox_c_20_40_1_50
unitbox_c_20_40_2_100 unitbox_c_20_40_2_25 unitbox_c_20_40_2_50
unitbox_c_20_40_3_100 unitbox_c_20_40_3_25 unitbox_c_20_40_3_50

unitbox_c.28.28.1.25	unitbox_c.28.28.2.25	unitbox_c.28.28.3.25
unitbox_c.28.42.1.25	unitbox_c.28.42.2.25	unitbox_c.28.42.3.25
unitbox_c.28.56.1.25	unitbox_c.28.56.2.25	unitbox_c.28.56.3.25
unitbox_c.30.30.1.100	unitbox_c.30.30.1.50	unitbox_c.30.30.2.100
unitbox_c.30.30.2.50	unitbox_c.30.30.3.100	unitbox_c.30.30.3.50
unitbox_c.30.45.1.100	unitbox_c.30.45.1.50	unitbox_c.30.45.2.100
unitbox_c.30.45.2.50	unitbox_c.30.45.3.100	unitbox_c.30.45.3.50
unitbox_c.30.60.1.100	unitbox_c.30.60.1.50	unitbox_c.30.60.2.100
unitbox_c.30.60.2.50	unitbox_c.30.60.3.100	unitbox_c.30.60.3.50
unitbox_c.40.40.1.100	unitbox_c.40.40.1.25	unitbox_c.40.40.1.50
unitbox_c.40.40.2.100	unitbox_c.40.40.2.25	unitbox_c.40.40.2.50
unitbox_c.40.40.3.100	unitbox_c.40.40.3.25	unitbox_c.40.40.3.50
unitbox_c.40.60.1.100	unitbox_c.40.60.1.25	unitbox_c.40.60.1.50
unitbox_c.40.60.2.100	unitbox_c.40.60.2.25	unitbox_c.40.60.2.50
unitbox_c.40.60.3.100	unitbox_c.40.60.3.25	unitbox_c.40.60.3.50
unitbox_c.40.80.1.100	unitbox_c.40.80.1.25	unitbox_c.40.80.1.50
unitbox_c.40.80.2.100	unitbox_c.40.80.2.25	unitbox_c.40.80.2.50
unitbox_c.40.80.3.100	unitbox_c.40.80.3.25	unitbox_c.40.80.3.50
unitbox_c.48.48.1.25	unitbox_c.48.48.2.25	unitbox_c.48.48.3.25
unitbox_c.48.72.1.25	unitbox_c.48.72.2.25	unitbox_c.48.72.3.25
unitbox_c.48.96.1.25	unitbox_c.48.96.2.25	unitbox_c.48.96.3.25
unitbox_c.50.100.1.100	unitbox_c.50.100.1.50	unitbox_c.50.100.2.100
unitbox_c.50.100.2.50	unitbox_c.50.100.3.100	unitbox_c.50.100.3.50
unitbox_c.50.50.1.100	unitbox_c.50.50.1.50	unitbox_c.50.50.2.100
unitbox_c.50.50.2.50	unitbox_c.50.50.3.100	unitbox_c.50.50.3.50
unitbox_c.50.75.1.100	unitbox_c.50.75.1.50	unitbox_c.50.75.2.100
unitbox_c.50.75.2.50	unitbox_c.50.75.3.100	unitbox_c.50.75.3.50
unitbox_c.8.12.1.25	unitbox_c.8.12.2.25	unitbox_c.8.12.3.25
unitbox_c.8.16.1.25	unitbox_c.8.16.2.25	unitbox_c.8.16.3.25
unitbox_c.8.8.1.25	unitbox_c.8.8.2.25	unitbox_c.8.8.3.25

2.9 37 Reformulated GLOBALLib [24, 41, 50]

alkylation_saxena	alkyl_saxena	ex14.1.1.saxena
ex14.1.2.saxena	ex4.1.1.saxena	ex4.1.3.saxena

ex4_1.4.saxena	ex4_1.5.saxena	ex4_1.6.saxena
ex4_1.7.saxena	ex4_1.8.saxena	ex4_1.9.saxena
ex7_3.1.saxena	ex7_3.2.saxena	ex8_1.3.saxena
ex8_1.4.saxena	ex8_1.5.saxena	ex8_1.7.saxena
ex8_1.8.saxena	ex8_4.2.saxena	harker.saxena
immun.saxena	mathopt1.saxena	mathopt2.saxena
prob09.saxena	process.saxena	prolog.saxena
rbrock.saxena	st_e03.saxena	st_e05.saxena
st_e10.saxena	st_e17.saxena	st_e19.saxena
st_e20.saxena	st_qpc-m0.saxena	st_qpk1.saxena
st_z.saxena		

2.10 11 Reformulated MINLPLib [9, 24]

elf_reformulated	eniplac_reformulated	fo7_2_reformulated
fo7_reformulated	fo8_reformulated	fo9_reformulated
m3_reformulated	m6_reformulated	m7_reformulated
o7_2_reformulated	o7_reformulated	

2.11 14 Standard Quadratic Programs (StQP) [51]

Problem_0030_75	Problem_0050_75	Problem_0100_01
Problem_0100_50	Problem_0100_75	Problem_0200_01
Problem_0200_50	Problem_0500_01	Problem_0500_25
Problem_1000_25	Problem_Q030	Problem_Q050
Problem_Q100	Problem_Q150	

2.12 32 Water Treatment System [17, 18]

castro_etal_2007_wts_Ex01_M1	castro_etal_2007_wts_Ex01_M2
castro_etal_2007_wts_Ex02_M1	castro_etal_2007_wts_Ex02_M2
castro_etal_2007_wts_Ex03_M1	castro_etal_2007_wts_Ex03_M2
castro_etal_2007_wts_Ex04_M1	castro_etal_2007_wts_Ex04_M2
castro_etal_2007_wts_Ex05_M1	castro_etal_2007_wts_Ex05_M2
castro_etal_2007_wts_Ex06_M1	castro_etal_2007_wts_Ex06_M2
castro_etal_2007_wts_Ex07_M1	castro_etal_2007_wts_Ex07_M2
castro_etal_2007_wts_Ex08_M1	castro_etal_2007_wts_Ex08_M2

castro.etal.2007.wts.Ex09.M1	castro.etal.2007.wts.Ex09.M2
castro.etal.2007.wts.Ex10.M1	castro.etal.2007.wts.Ex10.M2
castro.etal.2007.wts.Ex11.M1	castro.etal.2007.wts.Ex11.M2
castro.etal.2007.wts.Ex12.M1	castro.etal.2007.wts.Ex12.M2
castro.etal.2007.wts.Ex13.M1	castro.etal.2007.wts.Ex13.M2
castro.etal.2007.wts.Ex14.M1	castro.etal.2007.wts.Ex14.M2
castro.etal.2007.wts.Ex15.M1	castro.etal.2007.wts.Ex15.M2
castro.etal.2007.wts.Ex16.M1	castro.etal.2007.wts.Ex16.M2

2.13 35 Water-Using Network [16, 53, 54]

teles.etal.2009.WUN.Ex01	teles.etal.2009.WUN.Ex02
teles.etal.2009.WUN.Ex03	teles.etal.2009.WUN.Ex04
teles.etal.2009.WUN.Ex05	teles.etal.2009.WUN.Ex06
teles.etal.2009.WUN.Ex07	teles.etal.2009.WUN.Ex08
teles.etal.2009.WUN.Ex09	teles.etal.2009.WUN.Ex10
teles.etal.2009.WUN.Ex11	teles.etal.2009.WUN.Ex12
teles.etal.2009.WUN.Ex13	teles.etal.2009.WUN.Ex14
teles.etal.2009.WUN.Ex16	teles.etal.2009.WUN.Ex17
teles.etal.2009.WUN.Ex18	teles.etal.2009.WUN.Ex19
teles.etal.2009.WUN.Ex20	teles.etal.2009.WUN.Ex21
teles.etal.2009.WUN.Ex22	teles.etal.2009.WUN.Ex23
teles.etal.2009.WUN.Ex24	teles.etal.2009.WUN.Ex25
teles.etal.2009.WUN.Ex26	teles.etal.2009.WUN.Ex27
teles.etal.2009.WUN.Ex28	teles.etal.2009.WUN.Ex29
teles.etal.2009.WUN.Ex30	teles.etal.2009.WUN.Ex31
teles.etal.2009.WUN.Ex32	teles.etal.2009.WUN.Ex33
teles.etal.2009.WUN.Ex34	teles.etal.2009.WUN.Ex35
teles.etal.2009.WUN.Ex36	

3 Examples from Standard Test Libraries

3.1 34 AMPL Book Lib Test cases

The examples from the AMPL Book Library [25] are documented in Table 2.

- <http://www.gamsworld.org/performance/amplbook/amplbooklib.zip>

3.2 134 Bonmin Test Set

The examples from the Bonmin Test Set [6, 49] are documented in Table 3.

- <http://egon.cheme.cmu.edu/ibm/page.htm>

3.3 368 GLOBALLib

The examples from GLOBALLib [24, 41] are documented in Table 4.

- <http://www.gamsworld.org/global/globallib/globallib.zip>

3.4 39 LINLib

The examples from LINLib are documented in Table 5.

- <http://www.gamsworld.org/performance/plib/linlib.zip>

3.5 12 MacMOOPLib

The examples from MacMOOPLib are documented in Table 6.

- <http://www.gamsworld.org/performance/macmoop/macmooplib.zip>

3.6 22 MPLLib

The examples from MPLLib are documented in Table 8.

- <http://www.gamsworld.org/performance/mpllib/mpllib.zip>

3.7 249 MINLPLib

The examples from MINLPLib [9, 24] are documented in Table 7.

- <http://www.gamsworld.org/minlp/minlplib/minlplib.zip>

3.8 1116 PrincetonLib

The examples from PrincetonLib are documented in Table 9.

- <http://www.gamsworld.org/performance/princetonlib/princeton.zip>

References

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A Test Suite Definition

Table 2: 34 AMPL Book Library Case Studies; Accessed 11 March 2013 at <http://www.gamsworld.org/performance/amplbook/amplbooklib.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
blend	4	0	9	0
dietu1	9	0	9	0
iocol1	8	0	6	0
iocol2	12	0	6	0
iorow	8	0	6	0
minmax	27	0	16	0
multic	19	0	31	0

continued on the next page

Table 2 (AMPL Book Library) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
net1node	10	0	9	0
net3node	10	0	9	0
netasgn	15	0	11	0
netfeeds	27	0	13	0
netmax	16	0	6	0
netmcol	15	0	20	0
netmulti	15	0	20	0
netshort	11	0	7	0
netthru	10	0	9	0
nltrans	22	0	11	21
sched	1419858	0	18	0
steel4r	4	0	3	0
steelp3a	41	0	13	0
steelP	73	0	34	0
steelp11	29	0	13	4
steelp12	29	0	13	4
steelp13	29	0	13	12
steelp14	29	0	13	4
steelp15	29	0	13	12
steelT	25	0	13	0
transp2	22	0	11	0
transp11	22	0	11	21
transp12	22	0	11	19

Table 3: 134 Bonmin Case Studies; Accessed 11 March 2013 at <http://egon.cheme.cmu.edu/ibm/page.htm> [6, 49]

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
BatchS101006M	150	129	1020	49
BatchS121208M	204	203	1512	59
BatchS151208M	243	203	1782	62
BatchS201210M	308	251	2328	67
CLay0203M	13	18	55	48

continued on the next page

Table 3 (Bonmin) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
CLay0204M	21	32	91	64
CLay0205M	31	50	136	80
CLay0303M	13	21	67	72
CLay0304M	21	36	107	96
CLay0305M	31	55	156	120
FLay02H	43	4	52	2
FLay02M	11	4	12	2
FLay03H	111	12	145	3
FLay03M	15	12	25	3
FLay04H	211	24	283	4
FLay04M	19	24	43	4
FLay05H	343	40	466	5
FLay05M	23	40	66	5
FLay06H	507	60	694	6
FLay06M	27	60	94	6
RSyn0805H	272	37	430	9
RSyn0805M	102	69	287	3
RSyn0810H	302	42	484	18
RSyn0810M	112	74	313	6
RSyn0815H	341	47	553	33
RSyn0815M	127	79	348	11
RSyn0820H	366	52	605	42
RSyn0820M	132	84	372	14
RSyn0830H	433	62	717	60
RSyn0830M	157	94	426	20
RSyn0840H	497	72	838	84
RSyn0840M	177	104	485	28
SLay04H	117	24	175	8
SLay04M	21	24	55	8
SLay05H	191	40	291	10
SLay05M	31	40	91	10
SLay06H	283	60	436	12
SLay06M	43	60	136	12
SLay07H	393	84	610	14
SLay07M	57	84	190	14
SLay08H	521	112	813	16
SLay08M	73	112	253	16

continued on the next page

Table 3 (Bonmin) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
SLay09H	667	144	1045	18
SLay09M	91	144	325	18
SLay10H	831	180	1306	20
SLay10M	111	180	406	20
Syn05H	38	5	59	9
Syn05M	16	5	29	3
Syn10H	68	10	113	18
Syn10M02H	155	40	295	36
Syn10M02M	71	40	199	12
Syn10M03H	232	60	487	54
Syn10M03M	106	60	343	18
Syn10M04H	309	80	709	72
Syn10M04M	141	80	517	24
Syn15H	107	15	182	33
Syn15M	41	15	90	11
Syn20H	132	20	234	42
Syn20M	46	20	114	14
Syn30H	199	30	346	60
Syn30M	71	30	168	20
Syn40H	263	40	467	84
Syn40M	91	40	227	28

Table 4: 368 GLOBALlib Case Studies [24, 41]; Accessed 11 March 2013 at <http://www.gamsworld.org/global/globallib/globallib.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
abel	31	0	15	30
alkyl	15	0	8	19
arki0001	1031	0	514	512
arki0002	2457	0	1977	1064
arki0003	2283	0	2583	4080
arki0004	2091	0	2082	10400
arki0005	2371	0	5153	12768

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
arki0006	2371	0	5153	12768
arki0008	5073	0	5021	16334
arki0009	7715	0	6708	523
arki0010	4145	0	3428	263
arki0011	19315	0	17738	1218
arki0012	19315	0	17738	1218
arki0013	19315	0	17738	1218
arki0014	19306	0	17693	1218
arki0015	2094	0	1497	3841
arki0016	5048	0	2947	6631
arki0017	4333	0	2573	5982
arki0018	9805	0	10	9804
arki0019	511	0	3	510
arki0020	1263	0	3	1262
arki0021	3188	0	3	3187
arki0022	4153	0	3	4152
arki0023	8887	0	3	8886
arki0024	8677	0	26759	14053
bayes2_10	87	0	78	440
bayes2_20	87	0	78	440
bayes2_30	87	0	78	440
bayes2_50	87	0	78	440
bearing	14	0	13	28
btest14	136	0	94	224
camcge	280	0	243	850
camshape100	200	0	201	299
camshape200	400	0	401	599
camshape400	800	0	801	1199
camshape800	1600	0	1601	2399
catmix100	304	0	201	1200
catmix200	604	0	401	2400
catmix400	1204	0	801	4800
catmix800	2404	0	1601	9600
chain100	203	0	102	303
chain200	403	0	202	603
chain400	803	0	402	1203
chain50	103	0	52	153

continued on the next page

Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
chakra	63	0	42	41
chance	5	0	4	4
chem	12	0	5	11
chenery	44	0	39	56
circle	3	0	10	30
demo7	71	0	58	12
dispatch	5	0	3	6
elec100	301	0	101	600
elec200	601	0	201	1200
elec25	76	0	26	150
elec50	151	0	51	300
etamac	98	0	71	35
ex14.1.1	4	0	5	8
ex14.1.2	7	0	10	26
ex14.1.3	4	0	5	8
ex14.1.5	7	0	7	10
ex14.1.6	10	0	16	32
ex14.1.7	11	0	18	100
ex14.1.8	4	0	5	6
ex14.1.9	3	0	3	2
ex14.2.1	6	0	8	24
ex14.2.2	5	0	6	12
ex14.2.3	7	0	10	40
ex14.2.4	6	0	8	24
ex14.2.5	5	0	6	12
ex14.2.6	6	0	8	24
ex14.2.7	7	0	10	40
ex14.2.8	5	0	6	12
ex14.2.9	5	0	6	12
ex2.1.1	6	0	2	5
ex2.1.2	7	0	3	5
ex2.1.3	14	0	10	4
ex2.1.4	7	0	6	1
ex2.1.5	11	0	12	7
ex2.1.6	11	0	6	10
ex2.1.7	21	0	11	20
ex2.1.8	25	0	11	24

continued on the next page

Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
ex2_1_9	11	0	2	10
ex3_1_1	9	0	7	8
ex3_1_2	6	0	7	29
ex3_1_3	7	0	7	8
ex3_1_4	4	0	4	3
ex4_1_1	2	0	1	1
ex4_1_2	2	0	1	1
ex4_1_3	2	0	1	1
ex4_1_4	2	0	1	1
ex4_1_5	3	0	1	2
ex4_1_6	2	0	1	1
ex4_1_7	2	0	1	1
ex4_1_8	3	0	2	2
ex4_1_9	3	0	3	2
ex5_2_2_case1	10	0	7	7
ex5_2_2_case2	10	0	7	7
ex5_2_2_case3	10	0	7	7
ex5_2_4	8	0	7	16
ex5_2_5	33	0	20	195
ex5_3_2	23	0	17	24
ex5_3_3	63	0	54	200
ex5_4_2	9	0	7	8
ex5_4_3	17	0	14	18
ex5_4_4	28	0	20	33
ex6_1_1	9	0	7	20
ex6_1_2	5	0	4	10
ex6_1_3	13	0	10	36
ex6_1_4	7	0	5	18
ex6_2_10	7	0	4	6
ex6_2_11	4	0	2	3
ex6_2_12	5	0	3	4
ex6_2_13	7	0	4	6
ex6_2_14	5	0	3	4
ex6_2_5	10	0	4	9
ex6_2_6	4	0	2	3
ex6_2_7	10	0	4	9
ex6_2_8	4	0	2	3

continued on the next page

Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
ex6_2_9	5	0	3	4
ex7_2_1	8	0	15	35
ex7_2_2	7	0	6	10
ex7_2_3	9	0	7	10
ex7_2_4	9	0	5	14
ex7_3_1	5	0	8	3
ex7_3_2	5	0	8	3
ex7_3_3	6	0	9	5
ex7_3_4	13	0	18	23
ex7_3_5	14	0	16	25
ex7_3_6	18	0	18	54
ex8_1_3	3	0	1	2
ex8_1_4	3	0	1	2
ex8_1_5	3	0	1	2
ex8_1_6	3	0	1	2
ex8_1_7	6	0	6	13
ex8_2_1	56	0	32	103
ex8_2_2	7511	0	1948	15006
ex8_2_3	15637	0	3156	31256
ex8_2_4	56	0	82	303
ex8_2_5	2511	0	3775	30006
ex8_3_1	116	0	77	448
ex8_3_2	111	0	77	423
ex8_3_3	111	0	77	423
ex8_3_4	111	0	77	423
ex8_3_5	111	0	77	423
ex8_3_6	111	0	77	425
ex8_3_7	127	0	93	537
ex8_3_8	127	0	94	535
ex8_3_9	79	0	46	214
ex8_4_1	23	0	11	40
ex8_4_2	25	0	11	60
ex8_4_3	53	0	26	100
ex8_4_4	18	0	13	36
ex8_4_5	16	0	12	55
ex8_4_6	15	0	9	56
ex8_4_7	63	0	41	140

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
ex8_4_8	43	0	31	130
ex8_5_1	7	0	5	12
ex8_5_2	7	0	5	12
ex8_5_3	6	0	5	10
ex8_5_4	6	0	5	10
ex8_5_5	6	0	5	10
ex8_5_6	7	0	5	12
ex8_6_1	76	0	46	315
ex8_6_2	31	0	1	30
ex9_1_1	14	0	13	10
ex9_1_2	11	0	10	8
ex9_1_4	11	0	10	8
ex9_1_5	14	0	13	10
ex9_1_8	15	0	13	10
ex9_2_2	11	0	12	10
ex9_2_3	17	0	16	12
ex9_2_4	9	0	8	6
ex9_2_5	9	0	8	8
ex9_2_6	17	0	13	16
ex9_2_7	11	0	10	10
ex9_2_8	7	0	6	6
filter	3	0	2	3
flowchan100	2401	0	2399	1600
flowchan200	4801	0	4799	3200
flowchan400	9601	0	9599	6400
flowchan50	1201	0	1199	800
ganges	357	0	274	817
gasoil100	2604	0	2599	3002
gasoil200	5204	0	5199	5802
gasoil400	10404	0	10399	11402
gasoil50	1304	0	1299	1602
glider100	1316	0	1210	3018
glider200	2616	0	2410	6018
glider400	5216	0	4810	12018
glider50	666	0	610	1518
gsg_0001	78	0	112	44
gtm	64	0	25	20

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
harker	21	0	8	20
haverly	13	0	10	7
hhfair	30	0	26	21
himmel16	19	0	22	84
house	9	0	9	9
hs62	4	0	2	6
hydro	32	0	25	12
immun	22	0	8	6
infeas1	273	0	1615	3895
jbearing100	5305	0	1	5304
jbearing25	1405	0	1	1404
jbearing50	2705	0	1	2704
jbearing75	4005	0	1	4004
korcge	96	0	78	200
launch	39	0	29	52
least	4	0	1	3
like	10	0	4	9
linear	25	0	21	20
mathopt1	3	0	3	4
mathopt2	3	0	5	4
maxmin	27	0	78	312
meanvar	9	0	3	7
methanol100	3006	0	2998	5895
methanol200	6006	0	5998	11595
methanol400	12006	0	11998	22995
methanol50	1506	0	1498	3033
mhw4d	6	0	4	10
minlphi	65	0	80	36
minsurf100	5305	0	1	5304
minsurf25	1405	0	1	1404
minsurf50	2705	0	1	2704
minsurf75	4005	0	1	4004
nemhaus	6	0	6	5
otpop	104	0	77	83
pindyck	117	0	97	80
pinene100	5006	0	4996	5560
pinene200	10006	0	9996	10960

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
pinene50	2506	0	2496	2860
pollut	43	0	9	40
popdynm100	5616	0	5593	7584
popdynm200	11216	0	11193	14984
popdynm25	1416	0	1393	2274
popdynm50	2816	0	2793	4044
prob06	2	0	2	4
prob07	15	0	36	63
prob09	3	0	1	2
process	11	0	8	11
prolog	21	0	23	14
qp1	51	0	3	50
qp2	51	0	3	50
qp3	101	0	53	100
qp4	80	0	32	29
qp5	109	0	32	0
ramsey	34	0	23	22
rbrock	3	0	1	2
rocket100	608	0	503	1803
rocket200	1208	0	1003	3603
rocket400	2408	0	2003	7203
rocket50	308	0	253	903
sambal	18	0	11	13
sample	5	0	3	8
ship	11	0	17	31
srcpm	40	0	28	5
st_bpaf1a	11	0	11	10
st_bpaf1b	11	0	11	10
st_bpk1	5	0	7	4
st_bpv1	5	0	5	4
st_bpv2	5	0	6	3
st_bsj2	4	0	6	3
st_bsj3	7	0	2	6
st_bsj4	7	0	5	6
st_cqpf	5	0	7	4
st_cqpjk1	5	0	3	4
st_cqpjk2	4	0	2	3

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
st_e01	3	0	2	2
st_e02	4	0	4	4
st_e03	11	0	8	11
st_e04	5	0	3	5
st_e05	6	0	4	4
st_e06	4	0	4	3
st_e07	11	0	8	7
st_e08	3	0	3	4
st_e09	3	0	2	4
st_e11	4	0	3	4
st_e12	5	0	4	2
st_e16	13	0	10	18
st_e17	3	0	2	2
st_e18	3	0	5	4
st_e19	3	0	3	3
st_e21	7	0	7	3
st_e22	3	0	6	2
st_e23	3	0	3	2
st_e24	3	0	5	2
st_e25	5	0	9	4
st_e26	3	0	5	2
st_e28	10	0	5	16
st_e30	15	0	16	14
st_e33	10	0	7	7
st_e34	7	0	5	14
st_e37	5	0	2	4
st_e41	5	0	3	12
st_e42	8	0	3	4
st_fp7a	21	0	11	20
st_fp7b	21	0	11	20
st_fp7c	21	0	11	20
st_fp7d	21	0	11	20
st_fp7e	21	0	11	20
st_fp8	25	0	21	24
st_glmp_fp1	5	0	9	2
st_glmp_fp2	5	0	10	2
st_glmp_fp3	5	0	9	2

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
st_glmp_kk90	6	0	8	2
st_glmp_kk92	5	0	9	2
st_glmp_kky	8	0	14	4
st_glmp_ss1	6	0	12	2
st_glmp_ss2	6	0	9	2
st_ht	3	0	4	2
st_iqpbk1	9	0	8	8
st_iqpbk2	9	0	8	8
st_jcbpaf2	11	0	14	10
st_m1	21	0	12	20
st_m2	31	0	22	30
st_pan1	4	0	5	3
st_ph1	7	0	6	6
st_ph2	7	0	6	6
st_ph3	7	0	6	4
st_phex	3	0	6	2
st_qpc-m0	3	0	3	2
st_qpc-m1	6	0	6	5
st_qpc-m3a	11	0	11	10
st_qpc-m3b	11	0	11	10
st_qpc-m3c	11	0	11	10
st_qpc-m4	11	0	11	10
st_qpk1	3	0	5	2
st_qpk2	7	0	13	6
st_qpk3	12	0	23	11
st_robot	9	0	9	16
st_rv1	11	0	6	10
st_rv2	21	0	11	20
st_rv3	21	0	21	20
st_rv7	31	0	21	30
st_rv8	41	0	21	40
st_rv9	51	0	21	50
st_z	4	0	6	3
torsion100	5309	0	5	10606
torsion25	1409	0	5	2806
torsion50	2709	0	5	5406
torsion75	4009	0	5	8006

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Table 4 (GLOBALLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
turkey	519	0	288	55
wall	6	0	6	10
water	42	0	26	46
weapons	66	0	13	65

Table 5: 39 LINLib Case Studies; Accessed 11 March 2013 at <http://www.gamsworld.org/performance/plib/linlib.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
cl120a1311	72002	0	72321	28800
cl180a1311	162002	0	162481	64800
cl30a1311	4502	0	4581	1800
cl3a1311	47	0	54	18
cl60a1311	18002	0	18161	7200
cl90a1311	40502	0	40741	16200
iair04	1	8904	824	8904
iair05	1	7195	427	7195
ibcl	1500	252	1914	252
ibienst1	478	28	577	28
icap6000	1	6000	2172	6000
imas284	2	150	69	150
imisc07	2	259	213	259
ineos4	3989	17136	36704	17136
ineos5	3989	17136	36703	17136
iqiu	793	48	1193	48
iran13x13	170	169	196	169
iran8x32	257	256	297	256
iswath2	4192	2213	484	2213
nql201	161606	0	162141	80802
nql30	3602	0	3681	1800
q18a1311	5478	0	5501	2738
q30a1311	14886	0	14925	7442

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Table 5 (LINLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
q60a1311	58566	0	58645	29282
q9a1311	1446	0	1457	722
qssp12011	87848	0	72965	43923
qssp18011	196568	0	163445	98283
qssp1811	2168	0	1769	1083
qssp3011	5768	0	4745	2883
qssp6011	22328	0	18485	11163
qssp9011	49688	0	41225	24843
qt120a1311	73207	0	73044	29282
qt12a1311	847	0	828	338
qt180a1311	163807	0	163564	65522
qt18a1311	1807	0	1780	722
qt30a1311	4807	0	4764	1922
qt60a1311	18607	0	18524	7442
qt90a1311	41407	0	41284	16562
qt9a1311	502	0	487	200

Table 6: 12 MacMOOPLib Case Studies; Accessed 11 March 2013 at <http://www.gamsworld.org/performance/macmoop/macmoopl原因lib.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
abc-comp	3	0	4	4
ex001	6	0	4	11
ex002	6	0	3	3
ex003	3	0	3	5
ex005	3	0	1	2
hs05x	6	0	4	5
liswetm	9	0	3	7
molpg_1	9	0	9	0
molpg_2	13	0	17	0
molpg_3	11	0	15	0
moqp_1	24	0	14	60
moqp_2	24	0	13	60

continued on the next page

Table 6 (MacMOOPLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
moqp_3	24	0	14	60

Table 7: 249 MINLPLib Case Studies [9, 24]; Accessed 11 March 2013 at <http://www.gamsworld.org/minlp/minlplib/minlplib.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
4stufen	102	48	99	87
alan	5	4	8	3
batch	23	24	74	22
beuster	106	52	115	159
cecil_13	679	162	899	360
chp_partload	2204	45	2517	1916
contvar	210	87	285	530
csched1	14	63	23	8
csched2	93	308	138	58
du-opt	8	13	10	20
eg_all_s	1	7	28	196
eg_disc2_s	5	3	28	196
eg_disc_s	4	4	28	196
eg_int_s	5	3	28	196
elf	31	24	39	30
eniplac	118	24	190	48
enpro48	62	92	215	29
enpro56	55	73	192	24
ex1221	3	3	6	2
ex1222	3	1	4	2
ex1223	8	4	14	17
ex1224	4	8	8	6
ex1225	3	6	11	2
ex1226	3	3	6	2
ex1233	41	12	65	28
ex1243	53	16	97	36

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Table 7 (MINLPLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
ex1244	73	23	130	52
ex1252	25	15	44	36
ex1263	21	72	56	32
ex1264	21	68	56	32
ex1265	31	100	75	50
ex1266	43	138	96	72
ex3	25	8	32	5
ex4	12	25	31	127
fac1	17	6	19	16
fac2	55	12	34	54
fac3	55	12	34	54
feedtray	91	7	92	282
fo7	73	42	212	14
fo8	91	56	274	16
fo9	111	72	344	18
fuel	13	3	16	6
fuzzy	777	120	1057	79
gasnet	81	10	70	130
gastrans	86	21	150	45
gbd	2	3	5	1
gear	1	4	1	4
ghg_1veh	18	12	38	91
ghg_2veh	40	18	63	154
ghg_3veh	61	36	120	307
gkocis	9	3	9	2
hda	710	13	719	464
hmittelman	1	16	8	122
johnall	5	190	193	573
lop97ic	92	1662	92	8822
m3	21	6	44	6
m6	57	30	158	12
m7	73	42	212	14
mbtd	11	200	71	1400
meanvarx	22	14	45	7
minlphix	65	20	93	40
netmod_dol1	1537	462	3138	6
netmod_dol2	1537	462	3081	6

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Table 7 (MINLPLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
netmod.kar1	321	136	667	4
netmod.kar2	321	136	667	4
no7.ar2.1	71	42	270	14
no7.ar25.1	71	42	270	14
no7.ar3.1	71	42	270	14
no7.ar4.1	71	42	270	14
no7.ar5.1	71	42	270	14
nous1	49	2	44	122
nous2	49	2	44	122
nuclear104	12998	10816	14246	61108
nuclear10a	2091	10920	3340	44884
nuclear10b	12907	10920	24972	23252
nuclear14	987	576	1227	5520
nuclear25	1054	625	1304	5990
nuclear49	3335	2401	3874	17539
nuclearva	184	168	318	2024
nuclearvb	184	168	318	1988
nuclearvc	184	168	318	1988
nuclearvd	184	168	318	2864
nuclearve	184	168	318	2864
nuclearvf	184	168	318	2864
nvs01	2	2	4	7
nvs02	4	5	4	16
nvs03	1	2	3	3
nvs04	1	2	1	2
nvs05	7	2	10	24
nvs06	1	2	1	2
nvs07	1	3	3	3
nvs08	2	2	4	7
nvs09	1	10	1	10
nvs10	1	2	3	6
nvs11	1	3	4	12
nvs12	1	4	5	20
nvs13	1	5	6	30
nvs14	4	5	4	16
nvs15	1	3	2	3
nvs16	1	2	1	2

continued on the next page

Table 7 (MINLPLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
nvs17	1	7	8	56
nvs18	1	6	7	42
nvs19	1	8	9	72
nvs20	12	5	9	16
nvs21	2	2	3	7
nvs22	5	4	10	24
nvs23	1	9	10	90
nvs24	1	10	11	110
o7	73	42	212	14
o8_ar4_1	89	56	348	16
o9_ar4_1	109	72	436	18
oaer	7	3	8	2
oil	1517	19	1547	759
ortez	70	18	75	54
parallel	181	25	116	155
pb302035	1	600	51	600
pb302055	1	600	51	600
pb302075	1	600	51	600
pb302095	1	600	51	600
pb351535	1	525	51	525
pb351555	1	525	51	525
pb351575	1	525	51	525
pb351595	1	525	51	525
prob02	1	6	9	10
prob03	1	2	2	2
procsel	8	3	8	2
product	1447	107	1926	264
pump	16	9	35	36
qap	1	225	31	225
ravem	60	53	187	28
risk2b	452	12	581	3
saa_2	4008	400	6206	15400
sep1	28	2	32	12
space25	144	750	236	111
space960	4578	960	6498	4700
spectra2	40	30	73	240
spring	6	12	9	14

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Table 7 (MINLPLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
st_e13	2	1	3	1
st_e14	8	4	14	17
st_e15	3	3	6	2
st_e27	3	2	7	2
st_e29	4	8	8	6
st_e31	89	24	136	14
st_e32	18	18	19	63
st_e35	26	7	40	16
st_e36	2	1	3	6
st_e38	3	2	4	6
st_e40	2	3	9	6
st_miqp1	1	5	2	5
st_miqp2	1	4	4	2
st_miqp3	1	2	2	1
st_miqp4	4	3	5	3
st_miqp5	6	2	14	2
stockcycle	49	432	98	48
st_test1	1	5	2	4
st_test2	1	6	3	5
st_test3	1	13	11	5
st_test4	1	6	6	2
st_test5	1	10	12	7
st_test6	1	10	6	10
st_test8	1	24	21	24
st_testgr1	1	10	6	10
st_testgr3	1	20	21	20
st_testph4	1	3	11	3
super1	1264	44	1659	1201
super2	1264	44	1659	1201
super3	1264	44	1659	1201
synheat	45	12	65	28
synthes1	4	3	7	6
synthes2	7	5	15	8
synthes3	10	8	24	12
tln12	1	168	73	288
tln2	1	8	13	8
tln4	1	24	25	32

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Table 7 (MINLPLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
tln5	1	35	31	50
tln6	1	48	37	72
tln7	1	63	43	98
tloss	1	48	54	72
tls12	145	668	385	288
tls2	5	33	25	8
tls4	17	89	65	32
tls5	26	136	91	50
tls6	37	179	121	72
tls7	50	296	155	98
tltr	1	48	55	54
uselinear	6735	58	7031	14091
util	118	28	168	10
waste	2085	400	1992	2736
water4	70	126	138	46
waterx	57	14	55	60
waterz	70	126	138	46

Table 8: 22 MPLLib Case Studies; Accessed 11 March 2013 at <http://www.gamsworld.org/performance/mpllib/mpllib.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
exmpl13.2-1.nonlinearcons	3	0	3	2
exmpl13.2-2.nonlinearobjective	3	0	4	2
exmpl13.2-3.nonlinearobjective2	3	0	4	2
exmpl3.1-1.wyndorglass	3	0	4	0
exmpl3.4-1.marysradiation	3	0	4	0
exmpl3.4-2.kibbutzim	10	0	13	0
exmpl3.4-3.noriandleets	7	0	4	0
exmpl3.4-4b.saveitcomp	22	0	29	0
exmpl3.4-4.saveitcomp	15	0	22	0
exmpl3.4-5.unionairways	6	0	11	0
exmpl3.4-6.distrunlimited	8	0	8	0

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Table 8 (MPLLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
exmpl_7_1-1_wyndorglassdual	4	0	3	0
exmpl_7_3-1_upperbound	4	0	3	0
exmpl_8_1-1_pandtcomp	13	0	8	0
exmpl_8_1-2_northairplane	21	0	10	0
exmpl_8_1-3_metrowater	21	0	10	0
exmpl_8_3-1_jobshopco	17	0	9	0
exmpl_8_3-2a_betterprodco	16	0	9	0
exmpl_8_3-2b_betterprodco	26	0	11	0
exmpl_9_3-1_shortestpath	13	0	8	0
exmpl_9_5-1_maxflow	46	0	8	0
exmpl_9_6-1_mincost	8	0	6	0

Table 9: 1116 PrincetonLib Case Studies; Accessed 11 March 2013 at <http://www.gamsworld.org/performance/princetonlib/princeton.zip>

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
1	3010	0	3003	1501
2	322	0	304	243
3	3047	0	3008	4605
5	1552	0	1508	1177
antenna	353	0	599	297
antenna	372	0	488	314
aopf4	1773	0	1445	1021
bc4	1026	0	513	1024
bc5	2563	0	1537	1024
bc7	194	0	129	64
blend	25	0	15	288
braess	5	0	5	4
branin	3	0	1	2
camell	3	0	1	2
catenary	203	0	102	402
chemeq	41	0	15	40

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
chi	3	0	1	2
dcopf	49	0	34	0
dea	7	0	101	6
emfl	51	0	1	50
esfl	3	0	1	2
esfl	3	0	1	2
ex3_3.1a	1603	0	1600	2
ex3_3.1b	2403	0	2399	800
ex3_3.1c	2403	0	2399	801
ex3_4.1	2402	0	1600	801
ex3_5.1	1200	0	897	994
fekete	151	0	51	300
fermat2_eps	3	0	1	2
fermat2_eps	3	0	1	2
fermat2_vareps	4	0	1	3
fermat2_vareps	4	0	1	3
fermat_eps	3	0	1	2
fermat_eps	3	0	1	2
fermat_socp_eps	6	0	4	6
fermat_socp_eps	6	0	4	6
fermat_socp_vareps	7	0	4	9
fermat_socp_vareps	7	0	4	9
fermat_vareps	4	0	1	3
fermat_vareps	4	0	1	3
fir_convex	11	0	305	1001
fir_exp	12	0	306	2
fir_linear	11	0	304	0
fir_socp	12	0	306	2
gold	3	0	1	2
grasp	51	0	51	20
gridneta	73	0	1	72
griewank	3	0	1	2
growthopt	9	0	2	8
hang_midpt	1200	0	897	3731
hang_trap	359	0	355	1008
hs001	3	0	1	2
hs002	3	0	1	2

continued on the next page

Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
hs003	3	0	1	2
hs004	3	0	1	1
hs005	3	0	1	2
hs006	3	0	2	2
hs007	3	0	2	3
hs008	3	0	3	4
hs009	3	0	2	2
hs010	3	0	2	2
hs011	3	0	2	3
hs012	3	0	2	4
hs013	3	0	2	3
hs014	3	0	3	4
hs015	3	0	4	5
hs016	3	0	3	4
hs017	3	0	3	4
hs018	3	0	3	6
hs019	3	0	3	6
hs020	3	0	4	6
hs021	3	0	2	2
hs022	3	0	3	3
hs023	3	0	6	8
hs024	3	0	4	2
hs025	4	0	1	3
hs026	4	0	2	6
hs027	4	0	2	3
hs028	4	0	2	3
hs029	4	0	2	6
hs030	4	0	2	5
hs031	4	0	2	5
hs032	4	0	3	4
hs033	4	0	3	7
hs034	4	0	3	2
hs035	4	0	2	3
hs036	4	0	2	3
hs037	4	0	3	3
hs038	5	0	1	4
hs039	5	0	3	4

continued on the next page

Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
hs040	5	0	4	9
hs041	5	0	2	3
hs042	5	0	2	6
hs043	5	0	4	15
hs044	5	0	7	4
hs045	6	0	1	5
hs046	6	0	3	10
hs047	6	0	4	10
hs048	6	0	3	3
hs049	6	0	3	5
hs050	6	0	4	5
hs051	6	0	4	5
hs052	6	0	4	5
hs053	6	0	4	5
hs054	7	0	7	6
hs055	7	0	7	2
hs056	8	0	5	7
hs057	3	0	2	4
hs059	3	0	4	6
hs060	4	0	2	6
hs061	4	0	3	5
hs062	4	0	2	3
hs063	4	0	3	6
hs064	4	0	2	6
hs065	4	0	2	6
hs066	4	0	3	2
hs067	11	0	22	11
hs068	8	0	6	6
hs069	8	0	6	6
hs070	25	0	22	118
hs071	5	0	3	12
hs072	5	0	7	8
hs073	5	0	4	4
hs074	5	0	6	8
hs075	5	0	6	8
hs076	5	0	4	4
hs077	6	0	3	10

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
hs078	6	0	4	16
hs079	6	0	4	10
hs080	6	0	4	16
hs081	6	0	4	16
hs083	6	0	7	29
hs084	6	0	7	35
hs085	39	0	38	54
hs086	6	0	11	5
hs087	7	0	5	14
hs088	33	0	32	92
hs089	34	0	32	123
hs090	35	0	32	154
hs091	36	0	32	185
hs092	37	0	32	216
hs093	7	0	3	18
hs095	7	0	5	14
hs096	7	0	5	14
hs097	7	0	5	14
hs098	7	0	5	14
hs099	24	0	15	21
hs100	8	0	5	16
hs101	8	0	7	45
hs102	8	0	7	45
hs103	8	0	7	45
hs104	9	0	7	22
hs105	3	0	1	2
hs105	714	0	707	3055
hs106	9	0	7	8
hs106	9	0	7	8
hs107	16	0	13	52
hs108	10	0	14	48
hs109	10	0	11	36
hs109	10	0	11	36
hs110	11	0	1	10
hs111	11	0	4	24
hs111	11	0	4	24
hs112	11	0	4	10

continued on the next page

Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
hs112	11	0	4	10
hs113	11	0	9	21
hs114	15	0	12	11
hs114	15	0	12	11
hs116	14	0	16	31
hs116	14	0	16	31
hs117	16	0	6	10
hs118	16	0	30	15
hs119	17	0	9	16
hs15	3	0	3	5
hs23	3	0	6	8
hs35	4	0	2	3
hs44	5	0	7	4
hs5	3	0	1	2
hs6	3	0	2	2
hs8	3	0	3	4
hydrothermal	53	0	42	28
kowalik	5	0	1	4
levy3	3	0	1	2
ljcluster	66	0	46	225
logcheb	353	0	600	298
lowpass	333	0	531	0
markowitz	9	0	2	8
masa	9	0	6	4
maxcut	51	0	31	68
maxmineig1	201	0	111	588
maxmineig2	201	0	112	588
median	2	0	1	1
minsurf	1090	0	1	1089
moonshot	809	0	603	606
nnls	301	0	1	300
opf4	9730	0	7476	33521
optreward	9	0	3	8
optrisk	9	0	3	8
osborne1	6	0	1	5
pca	10	0	5	27
pf4	239	0	3	580

continued on the next page

Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
pgon	13	0	21	72
polygon	22	0	21	21
powell	5	0	1	4
price	3	0	1	2
putt	1137	0	1132	2514
robotarm	563	0	712	1161
robust	25	0	10	129
rocket	303	0	201	400
rosenbr	5	0	3	3
s201	3	0	1	2
s202	3	0	1	2
s203	6	0	4	9
s204	6	0	4	9
s205	3	0	1	2
s206	3	0	1	2
s207	3	0	1	2
s208	3	0	1	2
s209	3	0	1	2
s210	3	0	1	2
s211	3	0	1	2
s212	3	0	1	2
s213	3	0	1	2
s214	3	0	1	2
s215	3	0	2	1
s216	3	0	2	3
s217	3	0	3	2
s218	3	0	2	1
s219	5	0	3	4
s220	3	0	2	1
s221	3	0	2	1
s222	3	0	2	1
s223	3	0	3	2
s224	3	0	5	2
s225	3	0	6	8
s226	3	0	3	6
s227	3	0	3	4
s228	3	0	3	3

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
s229	3	0	1	2
s230	3	0	3	2
s231	3	0	3	2
s232	3	0	4	2
s233	3	0	2	4
s234	3	0	2	4
s235	4	0	2	3
s236	3	0	3	5
s237	3	0	4	6
s238	3	0	4	6
s239	3	0	2	4
s240	4	0	1	3
s241	9	0	6	14
s242	4	0	1	3
s243	8	0	5	13
s244	4	0	1	3
s245	4	0	1	3
s246	4	0	1	3
s247	5	0	2	6
s248	4	0	3	3
s249	4	0	2	5
s250	4	0	3	3
s251	4	0	2	3
s252	4	0	2	3
s253	4	0	2	3
s254	4	0	3	4
s255	5	0	1	4
s256	5	0	1	4
s257	5	0	1	4
s258	5	0	1	4
s259	5	0	1	4
s260	5	0	1	4
s261	5	0	1	4
s262	5	0	5	0
s263	5	0	5	6
s264	5	0	4	15
s265	5	0	3	4

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
s266	16	0	11	60
s267	6	0	1	5
s268	6	0	6	5
s269	6	0	4	5
s270	6	0	6	10
s271	7	0	1	6
s272	7	0	1	6
s273	7	0	1	6
s274	3	0	1	2
s275	5	0	1	4
s276	7	0	1	6
s277	5	0	5	0
s278	7	0	7	0
s279	9	0	9	0
s280	11	0	11	0
s281	11	0	1	10
s282	11	0	1	10
s283	11	0	1	10
s284	16	0	11	126
s285	16	0	11	126
s286	21	0	1	20
s287	21	0	1	20
s288	21	0	1	20
s289	31	0	1	30
s290	3	0	1	2
s291	11	0	1	10
s292	31	0	1	30
s293	51	0	1	50
s294	7	0	1	6
s295	11	0	1	10
s296	17	0	1	16
s297	31	0	1	30
s298	51	0	1	50
s299	101	0	1	100
s300	21	0	1	20
s301	51	0	1	50
s302	101	0	1	100

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
s303	21	0	1	20
s304	51	0	1	50
s305	101	0	1	100
s307	3	0	1	2
s308	3	0	1	2
s309	3	0	1	2
s311	3	0	1	2
s312	3	0	1	2
s314	5	0	3	6
s315	3	0	4	4
s316	3	0	2	4
s317	3	0	2	4
s318	3	0	2	4
s319	3	0	2	4
s320	3	0	2	4
s321	3	0	2	4
s322	3	0	2	4
s323	3	0	3	3
s324	3	0	3	6
s324	3	0	3	6
s325	3	0	4	4
s326	3	0	3	5
s327	3	0	2	4
s328	3	0	1	2
s329	3	0	4	8
s330	3	0	2	4
s331	3	0	2	2
s332	3	0	1	2
s333	4	0	1	3
s334	4	0	1	3
s335	4	0	3	4
s336	4	0	3	3
s337	4	0	2	5
s338	4	0	3	6
s339	4	0	2	6
s340	4	0	2	3
s341	4	0	2	6

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
s342	4	0	2	6
s343	4	0	3	7
s344	4	0	2	6
s345	4	0	2	6
s346	4	0	3	7
s347	7	0	5	9
s348	21	0	18	34
s350	5	0	1	4
s351	5	0	1	4
s352	5	0	1	4
s353	6	0	5	4
s354	5	0	2	4
s355	9	0	6	22
s356	10	0	11	29
s357	322	0	318	1124
s358	6	0	1	5
s359	6	0	15	0
s360	6	0	3	15
s361	6	0	7	35
s364	410	0	408	1245
s365	10	0	8	29
s366	8	0	15	35
s367	8	0	6	11
s368	9	0	1	8
s369	9	0	7	10
s370	7	0	1	6
s371	10	0	1	9
s372	10	0	13	30
s373	10	0	7	18
s374	46	0	71	350
s375	11	0	10	20
s376	11	0	16	37
s377	11	0	4	10
s378	11	0	4	24
s379	12	0	1	11
s380	13	0	4	25
s381	14	0	5	0

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Table 9 (PrincetonLib) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
s382	14	0	5	28
s383	15	0	2	14
s383	15	0	2	14
s384	16	0	11	126
s385	16	0	11	126
s386	3	0	1	2
s387	16	0	12	141
s388	16	0	26	141
s389	16	0	26	141
s391	961	0	961	1800
s392	34	0	31	33
s393	134	0	113	117
s394	21	0	2	40
s395	51	0	2	100
sawpath	594	0	785	588
schwefel	6	0	1	5
shear_midpt	1409	0	1201	4802
shekel	5	0	1	4
springs	33	0	11	50
stableair_midpt	1349	0	1195	4625
stableair_trap	1361	0	1355	3763
steenbre	577	0	73	72
structure	3651	0	480	0
trafequil	2087	0	1710	76
tre	3	0	1	2
weapon	101	0	13	65

Table 10: 115 minlp.org Case Studies

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
adhya1	14	0	31	153
adhya2	14	0	39	209
adhya3	21	0	44	328

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Table 10 (*minlp.org*) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
adhya4	19	0	58	468
ahmetovic_Ex1_NoEps	55	20	84	114
ahmetovic_Ex1_WithEps	55	20	84	114
ahmetovic_Ex2_NoEps	161	72	250	525
ahmetovic_Ex2_WithEps	161	72	250	525
batch_plant_nonconvex1	23	12	68	82
batch_plant_nonconvex2	41	36	206	232
bcp5	86	5	104	92
bcp6	113	6	135	148
bcp7	128	7	154	183
bcp8	161	8	191	261
bental4	9	0	8	7
bental5	39	0	26	96
CascadingTanks_MINLP_1Tank_20FE	461	40	518	514
CascadingTanks_MINLP_1Tank_40FE	921	80	1038	1034
CascadingTanks_MINLP_3Tank_20FE	1181	40	1558	1748
CascadingTanks_MINLP_3Tank_40FE	2361	80	3118	3508
CascadingTanks_MPCC_1Tank_20FE	662	0	439	714
CascadingTanks_MPCC_1Tank_40FE	1322	0	879	1434
CascadingTanks_MPCC_3Tank_20FE	1622	0	1239	2188
CascadingTanks_MPCC_3Tank_40FE	3242	0	2479	4388
caso-1-sc-v2	1507	50	1266	3116
concbased	401	25	355	520
Conventional	622	20	1129	1420
Escobar_HEN1	45	12	65	32
Escobar_HEN2	61	16	91	42
Escobar_HEN3	201	60	251	170
Ex1b_WaterNetwokProblem-WOEps_pw4	303	128	273	92
Ex_2__WaterNetwokProblem-NoEps_	926	408	838	450
flowbased_pw4	461	25	415	300
foulds2	23	0	13	26
foulds3	169	0	49	392
foulds4	169	0	49	392
foulds5	101	0	41	196
GMA_ethanol_model_BigM	14	24	73	47
GMA_ethanol_model_CH	38	24	81	47
haverly1	8	0	7	7

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Table 10 (*minlp.org*) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
haverly2	8	0	7	7
haverly3	8	0	7	7
kg_example1	78	0	65	92
kg_example2_pw4	325	84	211	184
kg_example3_pw4	268	56	179	180
kg_example4_pw4	557	108	385	450
lee1	41	9	83	128
lee2	45	9	93	192
meyer04	64	55	142	156
meyer10	208	187	424	930
meyer15	383	352	769	2070
MTG_EX1	77	48	196	95
MTG_EX2	118	112	307	126
MTG_EX5	113	78	309	164
MTG_EX6	174	176	481	218
ngw-r1-22020	981	460	1841	40
ngw-r1-236	67	27	115	9
ngw-r1-3510	161	70	281	15
ngw-r1-53050	3471	1680	6581	80
ngw-you-22020	2481	460	5301	40
ngw-you-236	124	27	256	9
ngw-you-33050	13641	1680	33191	80
ngw-you-3510	376	70	836	15
rt2	17	0	29	152
ruiz_concbased	356	5	320	525
ruiz_flowbased	416	5	380	305
Scheduler_LeeCrudeOil1.05	496	40	1241	640
Scheduler_LeeCrudeOil1.06	595	48	1504	768
Scheduler_LeeCrudeOil1.07	694	56	1777	896
Scheduler_LeeCrudeOil1.08	793	64	2060	1024
Scheduler_LeeCrudeOil1.09	892	72	2353	1152
Scheduler_LeeCrudeOil1.10	991	80	2656	1280
Scheduler_LeeCrudeOil2.05	1086	70	2582	1680
Scheduler_LeeCrudeOil2.06	1303	84	3118	2016
Scheduler_LeeCrudeOil2.07	1520	98	3671	2352
Scheduler_LeeCrudeOil2.08	1737	112	4241	2688
Scheduler_LeeCrudeOil2.09	1954	126	4828	3024

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Table 10 (*minlp.org*) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
Scheduler_LeeCrudeOil2_10	2171	140	5432	3360
Scheduler_LeeCrudeOil3_05	1211	70	2787	1960
Scheduler_LeeCrudeOil3_06	1453	84	3360	2352
Scheduler_LeeCrudeOil3_07	1695	98	3950	2744
Scheduler_LeeCrudeOil3_08	1937	112	4557	3136
Scheduler_LeeCrudeOil3_09	2179	126	5181	3528
Scheduler_LeeCrudeOil3_10	2421	140	5822	3920
Scheduler_LeeCrudeOil4_05	1861	95	4242	3040
Scheduler_LeeCrudeOil4_06	2233	114	5094	3648
Scheduler_LeeCrudeOil4_07	2605	133	5966	4256
Scheduler_LeeCrudeOil4_08	2977	152	6858	4864
Scheduler_LeeCrudeOil4_09	3349	171	7770	5472
Scheduler_LeeCrudeOil4_10	3721	190	8702	6080
smith_sahinidis_M1	106	23424	551	105
STG_EX1	217	198	262	175
STG_EX5	235	216	299	127
STG_EX6	310	384	388	166
TCD_MINLPorg	483	15	1311	840
wdn_signvar_blacksburg	184	513	381	175
wdn_signvar_foss_iron	270	812	617	290
wdn_signvar_foss_poly_0	270	464	617	290
wdn_signvar_foss_poly_1	270	1334	617	290
wdn_signvar_hanoi	169	238	372	170
wdn_signvar_modena	1541	4438	3439	1585
wdn_signvar_pescara	468	1386	1059	495
wdn_signvar_shamir	40	120	87	40
you_supply_chain_design_1	7	21	28	27
you_supply_chain_design_2	25	3	31	6
zondervan_UC_convex	241	720	5330	240
zondervan_UC_nonconvex	241	720	5330	480

Table 11: 482 MIQCQP from the Literature

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
alkylation_saxena	13	0	14	15
alkyl_saxena	17	0	10	20
bur26a	1	676	53	676
bur26b	1	676	53	676
bur26e	1	676	53	676
bur26f	1	676	53	676
bur26g	1	676	53	676
bur26h	1	676	53	676
castro_etal_2007_wts_Ex01_M1	13	0	11	6
castro_etal_2007_wts_Ex01_M2	28	0	34	8
castro_etal_2007_wts_Ex02_M1	20	0	15	16
castro_etal_2007_wts_Ex02_M2	42	0	45	24
castro_etal_2007_wts_Ex03_M1	23	0	16	16
castro_etal_2007_wts_Ex03_M2	51	0	54	24
castro_etal_2007_wts_Ex04_M1	24	0	22	32
castro_etal_2007_wts_Ex04_M2	56	0	66	36
castro_etal_2007_wts_Ex05_M1	47	0	41	90
castro_etal_2007_wts_Ex05_M2	134	0	152	96
castro_etal_2007_wts_Ex06_M1	47	0	41	90
castro_etal_2007_wts_Ex06_M2	134	0	152	96
castro_etal_2007_wts_Ex07_M1	47	0	41	90
castro_etal_2007_wts_Ex07_M2	134	0	152	96
castro_etal_2007_wts_Ex08_M1	73	0	73	180
castro_etal_2007_wts_Ex08_M2	279	0	335	168
castro_etal_2007_wts_Ex09_M1	127	0	113	420
castro_etal_2007_wts_Ex09_M2	517	0	573	420
castro_etal_2007_wts_Ex10_M1	65	0	31	70
castro_etal_2007_wts_Ex10_M2	156	0	138	120
castro_etal_2007_wts_Ex11_M1	119	0	43	126
castro_etal_2007_wts_Ex11_M2	304	0	252	224
castro_etal_2007_wts_Ex12_M1	197	0	58	240
castro_etal_2007_wts_Ex12_M2	517	0	408	440
castro_etal_2007_wts_Ex13_M1	383	0	84	510
castro_etal_2007_wts_Ex13_M2	1040	0	783	960
castro_etal_2007_wts_Ex14_M1	75	0	47	140

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
castro_etal_2007_wts_Ex14_M2	209	0	205	180
castro_etal_2007_wts_Ex15_M1	47	0	41	90
castro_etal_2007_wts_Ex15_M2	134	0	152	96
castro_etal_2007_wts_Ex16_M1	88	0	54	192
castro_etal_2007_wts_Ex16_M2	244	0	234	252
chr12a	1	144	25	144
chr12b	1	144	25	144
chr12c	1	144	25	144
chr15a	1	225	31	225
chr15b	1	225	31	225
chr15c	1	225	31	225
chr18a	1	324	37	324
chr18b	1	324	37	324
chr20a	1	400	41	400
chr20b	1	400	41	400
chr20c	1	400	41	400
chr22a	1	484	45	484
chr22b	1	484	45	484
chr25a	1	625	51	625
elf_reformulated	31	24	39	30
eniplac_reformulated	142	24	214	90
esc16b	1	256	33	240
esc16c	1	256	33	240
esc16d	1	256	33	224
esc16e	1	256	33	144
esc16g	1	256	33	128
esc16h	1	256	33	256
esc32a	1	1024	65	800
esc32b	1	1024	65	768
ex01	297	48	696	112
ex02	1193	105	5005	108
ex03	849	116	2443	384
ex05	825	116	1917	384
ex06	849	116	2437	384
ex11	1046	132	3506	384
ex14_1_1_saxena	8	0	11	20
ex14_1_2_saxena	8	0	11	33

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
ex21	1189	160	4682	384
ex4_1.1_saxena	4	0	4	9
ex4_1.3_saxena	4	0	4	9
ex4_1.4_saxena	4	0	4	8
ex4_1.5_saxena	5	0	4	10
ex4_1.6_saxena	4	0	4	9
ex4_1.7_saxena	3	0	2	3
ex4_1.8_saxena	4	0	3	3
ex4_1.9_saxena	4	0	4	5
ex7_3.1_saxena	11	0	18	33
ex7_3.2_saxena	10	0	14	13
ex8_1.3_saxena	9	0	7	14
ex8_1.4_saxena	5	0	4	10
ex8_1.5_saxena	6	0	5	12
ex8_1.7_saxena	10	0	10	23
ex8_1.8_saxena	9	0	8	10
ex8_4.2_saxena	45	0	31	110
fo7_2_reformulated	73	42	212	28
fo7_reformulated	73	42	212	28
fo8_reformulated	91	56	274	32
fo9_reformulated	111	72	344	36
had12	1	144	25	144
had14	1	196	29	196
had16	1	256	33	256
had18	1	324	37	324
had20	1	400	41	400
harker_saxena	35	0	22	48
immun_saxena	22	0	8	6
kallrath_packing_2009_circles.c6	18	0	54	86
kallrath_packing_2009_circles.c6	18	0	54	86
kallrath_packing_2009_circles.c6	20	0	63	114
kallrath_packing_2009_circles.c7	20	0	69	114
kallrath_packing_2009_circles.c8	22	0	86	146
kallrath_packing_2009_circlespol	1110	0	1134	1808
kallrath_packing_2009_circlespol	158	0	174	212
kallrath_packing_2009_circlespol	43	0	48	42
kallrath_packing_2009_circlespol	43	0	48	42

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
kallrath_packing_2009_circlespol	43	0	48	42
kallrath_packing_2009_circlespol	791	0	816	1262
kallrath_packing_2009_circlesrec	184	0	192	298
kallrath_packing_2009_circlesrec	390	0	388	600
kallrath_packing_2009_circlesrec	49	0	52	48
kallrath_packing_2009_circlesrec	49	0	52	48
kallrath_packing_2009_circlesrec	49	0	52	48
kallrath_packing_2009_circlesrec	634	0	619	968
kallrath_packing_2009_congruentc	10	0	16	14
kallrath_packing_2009_congruentc	10	0	16	14
kallrath_packing_2009_congruentc	12	0	24	26
kallrath_packing_2009_congruentc	12	0	24	26
kallrath_packing_2009_congruentc	14	0	34	42
kallrath_packing_2009_congruentc	14	0	34	42
kallrath_packing_2009_congruentc	16	0	46	62
kallrath_packing_2009_congruentc	16	0	46	62
kallrath_packing_2009_congruentc	16	0	46	62
kallrath_packing_2009_congruentc	18	0	60	86
kallrath_packing_2009_congruentc	18	0	60	86
kallrath_packing_2009_diffcircle	14	0	24	42
kallrath_packing_2009_diffcircle	14	0	24	42
kallrath_packing_2009_diffcircle	16	0	31	62
kallrath_packing_2009_diffcircle	18	0	40	86
kallrath_packing_2009_diffcircle	20	0	49	114
kallrath_packing_2009_diffcircle	22	0	60	146
kallrath_packing_2009_diffcircle	24	0	71	182
khor	2425	448	2507	232
kra32	1	1024	65	960
m3_reformulated	21	6	44	12
m6_reformulated	57	30	158	24
m7_reformulated	73	42	212	28
mathopt1_saxena	4	0	4	6
mathopt2_saxena	4	0	6	5
MPBP_6T_3P_2Q_029	67	36	214	64
MPBP_8T_3P_2Q_146	136	87	625	256
MPBP_8T_3P_2Q_718	136	87	607	244
MPBP_8T_3P_2Q_721	136	87	628	256

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
MPBP_8T_4P_2Q_480	185	120	857	376
MPBP_8T_4P_2Q_531	169	104	737	358
MPBP_8T_4P_2Q_852	185	120	861	376
nug05	1	25	11	25
nug06	1	36	13	36
nug07	1	49	15	49
nug08	1	64	17	64
nug10	1	100	21	100
nug12	1	144	25	144
nug14	1	196	29	196
nug15	1	225	31	225
nug16a	1	256	33	256
nug16b	1	256	33	256
nug17	1	289	35	289
nug18	1	324	37	324
nug20	1	400	41	400
nug21	1	441	43	441
nug22	1	484	45	484
nug24	1	576	49	576
nug25	1	625	51	625
nug27	1	729	55	729
nug28	1	784	57	784
o7.2_reformulated	73	42	212	28
o7_reformulated	73	42	212	28
pnt_pack_02.ORD	6	0	4	4
pnt_pack_03.ORD	8	0	7	12
pnt_pack_04.ORD	10	0	11	24
pnt_pack_05.ORD	12	0	16	40
pnt_pack_06.ORD	14	0	22	60
pnt_pack_07.ORD	16	0	29	84
pnt_pack_08.ORD	18	0	37	112
pnt_pack_09.ORD	20	0	46	144
pnt_pack_10.ORD	22	0	56	180
pnt_pack_11.ORD	24	0	67	220
pnt_pack_12.ORD	26	0	79	264
pnt_pack_13.ORD	28	0	92	312
pnt_pack_14.ORD	30	0	106	364

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
pnt_pack_15.ORD	32	0	121	420
prob09_saxena	4	0	2	4
Problem_0030_75	31	0	2	30
Problem_0050_75	51	0	2	50
Problem_0100_01	101	0	2	100
Problem_0100_50	101	0	2	100
Problem_0100_75	101	0	2	100
Problem_0200_01	201	0	2	200
Problem_0200_50	201	0	2	200
Problem_0500_01	501	0	2	500
Problem_0500_25	501	0	2	500
Problem_1000_25	1001	0	2	1000
Problem_Q030	31	0	2	30
Problem_Q050	51	0	2	50
Problem_Q100	101	0	2	100
Problem_Q150	151	0	2	150
process_saxena	13	0	10	13
prolog_saxena	21	0	23	14
rbrock_saxena	4	0	2	4
rou12	1	144	25	144
rou15	1	225	31	225
rou20	1	400	41	400
Sarawak_Scenario1	94	38	213	68
Sarawak_Scenario81	7534	38	11093	5508
scr12	1	144	25	144
scr15	1	225	31	225
spar020-100-1	21	0	1	20
spar020-100-2	21	0	1	20
spar020-100-3	21	0	1	20
spar030-060-1	31	0	1	30
spar030-060-2	31	0	1	30
spar030-060-3	31	0	1	30
spar030-070-1	31	0	1	30
spar030-070-2	31	0	1	30
spar030-070-3	31	0	1	30
spar030-080-1	31	0	1	30
spar030-080-2	31	0	1	30

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
spar030-080-3	31	0	1	30
spar030-090-1	31	0	1	30
spar030-090-2	31	0	1	30
spar030-090-3	31	0	1	30
spar030-100-1	31	0	1	30
spar030-100-2	31	0	1	30
spar030-100-3	31	0	1	30
spar040-030-1	41	0	1	40
spar040-030-2	41	0	1	40
spar040-030-3	41	0	1	40
spar040-040-1	41	0	1	40
spar040-040-2	41	0	1	40
spar040-040-3	41	0	1	40
spar040-050-1	41	0	1	40
spar040-050-2	41	0	1	40
spar040-050-3	41	0	1	40
spar040-060-1	41	0	1	40
spar040-060-2	41	0	1	40
spar040-060-3	41	0	1	40
spar040-070-1	41	0	1	40
spar040-070-2	41	0	1	40
spar040-070-3	41	0	1	40
spar040-080-1	41	0	1	40
spar040-080-2	41	0	1	40
spar040-080-3	41	0	1	40
spar040-090-1	41	0	1	40
spar040-090-2	41	0	1	40
spar040-090-3	41	0	1	40
spar040-100-1	41	0	1	40
spar040-100-2	41	0	1	40
spar040-100-3	41	0	1	40
spar050-030-1	51	0	1	50
spar050-030-2	51	0	1	50
spar050-030-3	51	0	1	50
spar050-040-1	51	0	1	50
spar050-040-2	51	0	1	50
spar050-040-3	51	0	1	50

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
spar050-050-1	51	0	1	50
spar050-050-2	51	0	1	50
spar050-050-3	51	0	1	50
spar060-020-1	61	0	1	60
spar060-020-2	61	0	1	60
spar060-020-3	61	0	1	60
spar070-025-1	71	0	1	70
spar070-025-2	71	0	1	70
spar070-025-3	71	0	1	70
spar070-050-1	71	0	1	70
spar070-050-2	71	0	1	70
spar070-050-3	71	0	1	70
spar070-075-1	71	0	1	70
spar070-075-2	71	0	1	70
spar070-075-3	71	0	1	70
spar080-025-1	81	0	1	80
spar080-025-2	81	0	1	80
spar080-025-3	81	0	1	80
spar080-050-1	81	0	1	80
spar080-050-2	81	0	1	80
spar080-050-3	81	0	1	80
spar080-075-1	81	0	1	80
spar080-075-2	81	0	1	80
spar080-075-3	81	0	1	80
spar090-025-1	91	0	1	90
spar090-025-2	91	0	1	90
spar090-025-3	91	0	1	90
spar090-050-1	91	0	1	90
spar090-050-2	91	0	1	90
spar090-050-3	91	0	1	90
spar090-075-1	91	0	1	90
spar090-075-2	91	0	1	90
spar090-075-3	91	0	1	90
spar100-025-1	101	0	1	100
spar100-025-2	101	0	1	100
spar100-025-3	101	0	1	100
spar100-050-1	101	0	1	100

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
spar100-050-2	101	0	1	100
spar100-050-3	101	0	1	100
spar100-075-1	101	0	1	100
spar100-075-2	101	0	1	100
spar100-075-3	101	0	1	100
st_e03_saxena	15	0	14	27
st_e05_saxena	6	0	4	4
st_e10_saxena	5	0	4	3
st_e17_saxena	3	0	2	2
st_e19_saxena	5	0	5	5
st_e20_saxena	9	0	8	10
st_qpc-m0_saxena	3	0	3	2
st_qpk1_saxena	3	0	5	2
st_z_saxena	4	0	6	3
tail0a	1	100	21	100
tail2a	1	144	25	144
tail5a	1	225	31	225
tail7a	1	289	35	289
tail20a	1	400	41	400
tail25a	1	625	51	625
tail30a	1	900	61	900
tail35a	1	1225	71	1225
teles_etal_2009_WUN_Ex01	41	0	39	78
teles_etal_2009_WUN_Ex02	69	0	77	208
teles_etal_2009_WUN_Ex03	65	0	77	208
teles_etal_2009_WUN_Ex04	71	0	55	136
teles_etal_2009_WUN_Ex05	94	0	60	152
teles_etal_2009_WUN_Ex06	106	0	116	375
teles_etal_2009_WUN_Ex07	111	0	136	450
teles_etal_2009_WUN_Ex08	91	0	96	300
teles_etal_2009_WUN_Ex09	133	0	163	612
teles_etal_2009_WUN_Ex10	51	0	52	117
teles_etal_2009_WUN_Ex11	65	0	65	156
teles_etal_2009_WUN_Ex12	53	0	45	104
teles_etal_2009_WUN_Ex13	99	0	91	272
teles_etal_2009_WUN_Ex14	126	0	136	456
teles_etal_2009_WUN_Ex16	83	0	84	240

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
teles_etal_2009_WUN_Ex17	75	0	67	180
teles_etal_2009_WUN_Ex18	61	0	65	156
teles_etal_2009_WUN_Ex19	69	0	77	208
teles_etal_2009_WUN_Ex20	176	0	133	460
teles_etal_2009_WUN_Ex21	121	0	127	408
teles_etal_2009_WUN_Ex22	147	0	136	456
teles_etal_2009_WUN_Ex23	159	0	154	570
teles_etal_2009_WUN_Ex24	140	0	136	456
teles_etal_2009_WUN_Ex25	122	0	88	285
teles_etal_2009_WUN_Ex26	337	0	289	1740
teles_etal_2009_WUN_Ex27	433	0	209	1184
teles_etal_2009_WUN_Ex28	761	0	541	5400
teles_etal_2009_WUN_Ex29	669	0	433	3780
teles_etal_2009_WUN_Ex30	721	0	451	4050
teles_etal_2009_WUN_Ex31	781	0	541	5400
teles_etal_2009_WUN_Ex32	661	0	381	3600
teles_etal_2009_WUN_Ex33	425	0	245	1628
teles_etal_2009_WUN_Ex34	489	0	269	1924
teles_etal_2009_WUN_Ex35	483	0	324	2405
teles_etal_2009_WUN_Ex36	325	0	240	1395
unitbox_c_10_10_1_100	11	0	11	110
unitbox_c_10_10_1_50	11	0	11	110
unitbox_c_10_10_2_100	11	0	11	110
unitbox_c_10_10_2_50	11	0	11	110
unitbox_c_10_10_3_100	11	0	11	110
unitbox_c_10_10_3_50	11	0	11	110
unitbox_c_10_15_1_100	11	0	16	160
unitbox_c_10_15_1_50	11	0	16	160
unitbox_c_10_15_2_100	11	0	16	160
unitbox_c_10_15_2_50	11	0	16	160
unitbox_c_10_15_3_100	11	0	16	160
unitbox_c_10_15_3_50	11	0	16	160
unitbox_c_10_20_1_100	11	0	21	210
unitbox_c_10_20_1_50	11	0	21	210
unitbox_c_10_20_2_100	11	0	21	210
unitbox_c_10_20_2_50	11	0	21	210
unitbox_c_10_20_3_100	11	0	21	210

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
unitbox_c_10_20_3_50	11	0	21	210
unitbox_c_20_20_1_100	21	0	21	420
unitbox_c_20_20_1_25	21	0	21	419
unitbox_c_20_20_1_50	21	0	21	420
unitbox_c_20_20_2_100	21	0	21	420
unitbox_c_20_20_2_25	21	0	21	420
unitbox_c_20_20_2_50	21	0	21	420
unitbox_c_20_20_3_100	21	0	21	420
unitbox_c_20_20_3_25	21	0	21	420
unitbox_c_20_20_3_50	21	0	21	420
unitbox_c_20_30_1_100	21	0	31	620
unitbox_c_20_30_1_25	21	0	31	619
unitbox_c_20_30_1_50	21	0	31	620
unitbox_c_20_30_2_100	21	0	31	620
unitbox_c_20_30_2_25	21	0	31	620
unitbox_c_20_30_2_50	21	0	31	620
unitbox_c_20_30_3_100	21	0	31	620
unitbox_c_20_30_3_25	21	0	31	620
unitbox_c_20_30_3_50	21	0	31	620
unitbox_c_20_40_1_100	21	0	41	820
unitbox_c_20_40_1_25	21	0	41	819
unitbox_c_20_40_1_50	21	0	41	820
unitbox_c_20_40_2_100	21	0	41	820
unitbox_c_20_40_2_25	21	0	41	820
unitbox_c_20_40_2_50	21	0	41	820
unitbox_c_20_40_3_100	21	0	41	820
unitbox_c_20_40_3_25	21	0	41	820
unitbox_c_20_40_3_50	21	0	41	820
unitbox_c_28_28_1_25	29	0	29	811
unitbox_c_28_28_2_25	29	0	29	812
unitbox_c_28_28_3_25	29	0	29	812
unitbox_c_28_42_1_25	29	0	43	1203
unitbox_c_28_42_2_25	29	0	43	1204
unitbox_c_28_42_3_25	29	0	43	1204
unitbox_c_28_56_1_25	29	0	57	1595
unitbox_c_28_56_2_25	29	0	57	1596
unitbox_c_28_56_3_25	29	0	57	1596

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
unitbox_c_30_30_1_100	31	0	31	930
unitbox_c_30_30_1_50	31	0	31	930
unitbox_c_30_30_2_100	31	0	31	930
unitbox_c_30_30_2_50	31	0	31	930
unitbox_c_30_30_3_100	31	0	31	930
unitbox_c_30_30_3_50	31	0	31	930
unitbox_c_30_45_1_100	31	0	46	1380
unitbox_c_30_45_1_50	31	0	46	1380
unitbox_c_30_45_2_100	31	0	46	1380
unitbox_c_30_45_2_50	31	0	46	1380
unitbox_c_30_45_3_100	31	0	46	1380
unitbox_c_30_45_3_50	31	0	46	1380
unitbox_c_30_60_1_100	31	0	61	1830
unitbox_c_30_60_1_50	31	0	61	1830
unitbox_c_30_60_2_100	31	0	61	1830
unitbox_c_30_60_2_50	31	0	61	1830
unitbox_c_30_60_3_100	31	0	61	1830
unitbox_c_30_60_3_50	31	0	61	1830
unitbox_c_40_40_1_100	41	0	41	1640
unitbox_c_40_40_1_25	41	0	41	1640
unitbox_c_40_40_1_50	41	0	41	1640
unitbox_c_40_40_2_100	41	0	41	1640
unitbox_c_40_40_2_25	41	0	41	1640
unitbox_c_40_40_2_50	41	0	41	1640
unitbox_c_40_40_3_100	41	0	41	1640
unitbox_c_40_40_3_25	41	0	41	1640
unitbox_c_40_40_3_50	41	0	41	1640
unitbox_c_40_60_1_100	41	0	61	2440
unitbox_c_40_60_1_25	41	0	61	2440
unitbox_c_40_60_1_50	41	0	61	2440
unitbox_c_40_60_2_100	41	0	61	2440
unitbox_c_40_60_2_25	41	0	61	2440
unitbox_c_40_60_2_50	41	0	61	2440
unitbox_c_40_60_3_100	41	0	61	2440
unitbox_c_40_60_3_25	41	0	61	2440
unitbox_c_40_60_3_50	41	0	61	2440
unitbox_c_40_80_1_100	41	0	81	3240

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Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
unitbox_c.40_80_1_25	41	0	81	3240
unitbox_c.40_80_1_50	41	0	81	3240
unitbox_c.40_80_2_100	41	0	81	3240
unitbox_c.40_80_2_25	41	0	81	3240
unitbox_c.40_80_2_50	41	0	81	3240
unitbox_c.40_80_3_100	41	0	81	3240
unitbox_c.40_80_3_25	41	0	81	3240
unitbox_c.40_80_3_50	41	0	81	3240
unitbox_c.48_48_1_25	49	0	49	2352
unitbox_c.48_48_2_25	49	0	49	2352
unitbox_c.48_48_3_25	49	0	49	2351
unitbox_c.48_72_1_25	49	0	73	3504
unitbox_c.48_72_2_25	49	0	73	3504
unitbox_c.48_72_3_25	49	0	73	3503
unitbox_c.48_96_1_25	49	0	97	4656
unitbox_c.48_96_2_25	49	0	97	4656
unitbox_c.48_96_3_25	49	0	97	4655
unitbox_c.50_100_1_100	51	0	101	5050
unitbox_c.50_100_1_50	51	0	101	5050
unitbox_c.50_100_2_100	51	0	101	5050
unitbox_c.50_100_2_50	51	0	101	5050
unitbox_c.50_100_3_100	51	0	101	5050
unitbox_c.50_100_3_50	51	0	101	5050
unitbox_c.50_50_1_100	51	0	51	2550
unitbox_c.50_50_1_50	51	0	51	2550
unitbox_c.50_50_2_100	51	0	51	2550
unitbox_c.50_50_2_50	51	0	51	2550
unitbox_c.50_50_3_100	51	0	51	2550
unitbox_c.50_50_3_50	51	0	51	2550
unitbox_c.50_75_1_100	51	0	76	3800
unitbox_c.50_75_1_50	51	0	76	3800
unitbox_c.50_75_2_100	51	0	76	3800
unitbox_c.50_75_2_50	51	0	76	3800
unitbox_c.50_75_3_100	51	0	76	3800
unitbox_c.50_75_3_50	51	0	76	3800
unitbox_c.8_12_1_25	9	0	13	99
unitbox_c.8_12_2_25	9	0	13	98

continued on the next page

Table 11 (MIQCQP) continued

Problem Name	# Variables		# Constraints	# Nonlinear Terms
	Contin	Discrete		
unitbox_c-8_12_3_25	9	0	13	100
unitbox_c-8_16_1_25	9	0	17	129
unitbox_c-8_16_2_25	9	0	17	130
unitbox_c-8_16_3_25	9	0	17	131
unitbox_c-8_8_1_25	9	0	9	69
unitbox_c-8_8_2_25	9	0	9	68
unitbox_c-8_8_3_25	9	0	9	69
wil50	1	2500	101	2500