

# Supplementary File for “Constraints Separation-Based Evolutionary Multitasking for Constrained Multi-Objective Optimization Problems”

TABLE S-I  
IGD+ RESULTS (MEAN (STD)) OF CSEMT, CSEMT- $S_1$ , CSEMT- $S_2$ , AND CSEMT-RA, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	CSEMT- $S_1$	CSEMT- $S_2$	CSEMT	CSEMT-RA	CSEMT
MW1	1	1.1734e-3 (1.98e-5) –	1.1397e-3 (2.74e-5) =	<b>1.1383e-3 (1.60e-5)</b>	<b>1.1303e-3 (1.69e-5) =</b>	1.1383e-3 (1.60e-5)
MW2	1	<b>1.7015e-2 (7.66e-3) =</b>	1.8476e-2 (8.09e-3) =	1.8055e-2 (1.55e-2)	<b>1.5406e-2 (7.23e-3) =</b>	1.8055e-2 (1.55e-2)
MW3	2	3.0297e-3 (2.13e-4) –	2.9131e-3 (3.59e-4) =	<b>2.7998e-3 (2.98e-4)</b>	3.0927e-3 (3.53e-4) –	<b>2.7998e-3 (2.98e-4)</b>
MW4	1	2.9376e-2 (3.29e-4) –	2.8267e-2 (2.25e-4) =	<b>2.8202e-2 (1.78e-4)</b>	2.8264e-2 (2.20e-4) =	<b>2.8202e-2 (1.78e-4)</b>
MW5	3	<b>4.4509e-4 (1.39e-4) +</b>	1.0461e-3 (9.16e-4) –	4.9719e-4 (8.93e-4)	<b>4.2500e-4 (1.91e-4) +</b>	4.9719e-4 (8.93e-4)
MW6	1	<b>1.4420e-2 (9.88e-3) =</b>	3.2077e-2 (7.01e-2) =	1.8111e-2 (1.23e-2)	1.9025e-2 (1.23e-2) =	<b>1.8111e-2 (1.23e-2)</b>
MW7	2	<b>1.9019e-3 (1.69e-4) =</b>	1.9957e-3 (2.05e-4) =	1.9422e-3 (2.29e-4)	<b>1.8885e-3 (1.86e-4) =</b>	1.9422e-3 (2.29e-4)
MW8	1	2.7973e-2 (8.06e-3) =	<b>2.6155e-2 (4.82e-3) =</b>	2.7644e-2 (6.27e-3)	2.8703e-2 (8.99e-3) =	<b>2.7644e-2 (6.27e-3)</b>
MW9	1	3.2243e-3 (1.28e-3) =	<b>3.0172e-3 (2.68e-4) =</b>	2.4941e-2 (1.19e-1)	<b>1.3881e-2 (5.85e-2) =</b>	2.4941e-2 (1.19e-1)
MW10	3	1.3823e-2 (1.13e-2) –	5.2459e-2 (7.14e-2) –	<b>1.1114e-2 (8.70e-3)</b>	1.6185e-2 (1.26e-2) =	<b>1.1114e-2 (8.70e-3)</b>
MW11	4	<b>2.7958e-3 (1.34e-4) =</b>	2.8781e-3 (8.64e-4) –	2.8473e-3 (1.30e-4)	<b>2.8123e-3 (1.63e-4) =</b>	2.8473e-3 (1.30e-4)
MW12	2	3.0185e-3 (1.27e-4) –	2.7525e-2 (1.34e-1) –	<b>2.7469e-3 (1.02e-4)</b>	2.4595e-2 (1.18e-1) –	<b>2.7469e-3 (1.02e-4)</b>
MW13	2	2.4784e-2 (2.38e-2) =	4.0888e-2 (4.18e-2) –	<b>2.3951e-2 (1.66e-2)</b>	2.4423e-2 (1.68e-2) =	<b>2.3951e-2 (1.66e-2)</b>
MW14	1	6.4840e-2 (2.31e-3) –	<b>6.0910e-2 (2.53e-3) =</b>	6.0946e-2 (1.91e-3)	6.1417e-2 (3.52e-3) =	<b>6.0946e-2 (1.91e-3)</b>
DASCMP1	11	1.0496e-2 (8.06e-3) =	1.3620e-2 (7.14e-3) =	<b>1.0271e-2 (8.15e-3)</b>	<b>8.3812e-3 (6.86e-3) =</b>	1.0271e-2 (8.15e-3)
DASCMP2	11	8.0480e-3 (5.61e-3) –	8.9474e-3 (5.66e-3) –	<b>5.8622e-3 (7.40e-3)</b>	7.8059e-3 (6.96e-3) –	<b>5.8622e-3 (7.40e-3)</b>
DASCMP3	11	1.5524e-2 (6.75e-3) –	2.8068e-2 (1.76e-2) –	<b>1.4813e-2 (6.76e-3)</b>	1.7667e-2 (5.81e-3) –	<b>1.4813e-2 (6.76e-3)</b>
DASCMP4	11	2.4629e-3 (1.05e-3) –	<b>6.8800e-4 (5.61e-4) +</b>	8.3295e-4 (2.42e-4)	2.2607e-3 (1.13e-3) –	<b>8.3295e-4 (2.42e-4)</b>
DASCMP5	11	4.0647e-3 (4.40e-4) –	<b>2.1098e-3 (3.86e-4) +</b>	2.4027e-3 (2.31e-4)	3.7832e-3 (5.13e-4) –	<b>2.4027e-3 (2.31e-4)</b>
DASCMP6	11	6.7972e-3 (5.85e-4) –	8.8034e-3 (5.24e-3) –	<b>6.7254e-3 (3.55e-3)</b>	6.7445e-3 (8.04e-4) –	<b>6.7254e-3 (3.55e-3)</b>
DASCMP7	7	2.9057e-2 (1.70e-3) –	<b>2.4150e-2 (1.45e-3) =</b>	2.4665e-2 (7.20e-4)	2.7180e-2 (1.82e-3) –	<b>2.4665e-2 (7.20e-4)</b>
DASCMP8	7	2.2568e-2 (1.06e-3) –	1.9053e-2 (1.22e-3) =	<b>1.8900e-2 (7.10e-4)</b>	2.1476e-2 (1.35e-3) –	<b>1.8900e-2 (7.10e-4)</b>
DASCMP9	7	2.1481e-2 (1.23e-3) –	<b>1.8179e-2 (5.41e-4) =</b>	1.8271e-2 (7.21e-4)	2.0062e-2 (1.02e-3) –	<b>1.8271e-2 (7.21e-4)</b>
LIRCMP1	2	<b>2.2563e-2 (7.72e-3) =</b>	6.7153e-2 (4.11e-2) –	2.5092e-2 (9.99e-3)	2.7307e-2 (1.13e-2) =	<b>2.5092e-2 (9.99e-3)</b>
LIRCMP2	2	2.4334e-2 (7.73e-3) =	4.1002e-2 (1.45e-2) –	<b>2.3845e-2 (6.65e-3)</b>	2.5064e-2 (7.92e-3) =	<b>2.3845e-2 (6.65e-3)</b>
LIRCMP3	3	<b>4.8205e-2 (4.24e-2) +</b>	9.7959e-2 (5.68e-2) –	5.5999e-2 (2.61e-2)	5.7139e-2 (3.36e-2) =	<b>5.5999e-2 (2.61e-2)</b>
LIRCMP4	3	3.8710e-2 (2.84e-2) =	6.7130e-2 (3.98e-2) –	<b>3.5175e-2 (1.84e-2)</b>	4.0061e-2 (1.80e-2) =	<b>3.5175e-2 (1.84e-2)</b>
LIRCMP5	2	1.2064e-2 (4.32e-3) =	3.6169e-1 (4.94e-1) –	<b>1.0734e-2 (3.95e-3)</b>	1.0839e-2 (6.30e-3) =	<b>1.0734e-2 (3.95e-3)</b>
LIRCMP6	2	<b>8.6572e-3 (2.01e-3) =</b>	3.3130e-1 (4.21e-1) –	1.1582e-2 (5.35e-3)	<b>9.3295e-3 (3.27e-3) =</b>	1.1582e-2 (5.35e-3)
LIRCMP7	3	7.7770e-3 (1.58e-3) –	7.3185e-3 (1.44e-3) –	<b>6.6939e-3 (7.87e-4)</b>	7.6928e-3 (1.46e-3) –	<b>6.6939e-3 (7.87e-4)</b>
LIRCMP8	3	7.1768e-3 (1.05e-3) –	2.2196e-2 (4.07e-2) –	<b>6.6123e-3 (1.69e-3)</b>	7.1424e-3 (1.57e-3) –	<b>6.6123e-3 (1.69e-3)</b>
LIRCMP9	2	<b>1.5471e-2 (1.84e-2) =</b>	9.9719e-2 (1.48e-1) –	2.1404e-2 (2.04e-2)	2.6003e-2 (2.63e-2) =	<b>2.1404e-2 (2.04e-2)</b>
LIRCMP10	2	0.0000e+0 (0.00e+0) =	2.1962e-4 (1.20e-3) =	0.0000e+0 (0.00e+0)	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0)
LIRCMP11	2	7.4100e-4 (2.57e-4) –	2.7404e-3 (9.03e-3) –	<b>6.2761e-4 (1.36e-4)</b>	6.7158e-4 (1.29e-4) –	<b>6.2761e-4 (1.36e-4)</b>
LIRCMP12	2	<b>1.5747e-3 (2.83e-3) =</b>	1.5715e-2 (1.68e-2) –	2.3495e-3 (3.50e-3)	3.0055e-3 (4.08e-3) =	<b>2.3495e-3 (3.50e-3)</b>
LIRCMP13	2	4.8425e-2 (3.69e-3) –	8.4255e-2 (2.32e-1) =	<b>4.0897e-2 (3.09e-3)</b>	4.3162e-2 (3.18e-3) –	<b>4.0897e-2 (3.09e-3)</b>
LIRCMP14	3	5.1310e-2 (5.37e-3) –	4.9226e-2 (4.60e-3) –	<b>4.3260e-2 (3.27e-3)</b>	4.7926e-2 (5.22e-3) –	<b>4.3260e-2 (3.27e-3)</b>
+/-/=		2/19/16	2/20/15		1/15/21	

TABLE S-II  
IGD+ RESULTS (MEAN (STD)) OF CSEMT WITH DIFFERENT AUXILIARY TASKS ON THE SECOND STAGE, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	$C_1$	$C_2$	$C_3$	$C_{1,2}$	$C_{1,3}$	$C_{2,3}$	CSEMT
MW3	2	3.1905e-3 (3.33e-4) -	<b>2.7161e-3 (2.63e-4) =</b>	3.0870e-3 (2.01e-4) -	3.0044e-3 (3.52e-4) -	3.1273e-3 (3.13e-4) -	2.9804e-3 (2.46e-4) -	2.7998e-3 (2.98e-4)
MW12	2	2.7977e-3 (9.99e-5) -	3.0562e-3 (1.29e-4) -	2.7500e-2 (1.34e-1) -	2.8936e-3 (1.07e-4) -	2.8936e-3 (1.12e-4) -	3.2054e-3 (1.66e-4) -	<b>2.7469e-3 (1.02e-4)</b>
LIRCOP13	2	4.2358e-2 (3.15e-3) =	4.2249e-2 (4.97e-3) =	4.1518e-2 (3.42e-3) =	4.4506e-2 (4.13e-3) -	4.2616e-2 (3.05e-3) -	4.3689e-2 (4.62e-3) -	<b>4.0897e-2 (3.09e-3)</b>
+/-/=		0/2/1	0/1/2	0/2/1	0/3/0	0/3/0	0/3/0	

TABLE S-III  
IGD+ RESULTS (MEAN (STD)) OF CSEMT AND CSEMT-E, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	CSEMT-E	CSEMT
MW1	1	<b>1.1367e-3 (1.37e-5) =</b>	1.1383e-3 (1.60e-5)
MW2	1	<b>1.6466e-2 (8.94e-3) =</b>	1.8055e-2 (1.55e-2)
MW3	2	3.0450e-3 (2.94e-4) -	<b>2.7998e-3 (2.98e-4)</b>
MW4	1	2.8241e-2 (1.99e-4) =	<b>2.8202e-2 (1.78e-4)</b>
MW5	3	5.3269e-4 (6.17e-4) =	<b>4.9719e-4 (8.93e-4)</b>
MW6	1	3.2916e-2 (8.26e-2) =	<b>1.8111e-2 (1.23e-2)</b>
MW7	2	<b>1.9192e-3 (2.56e-4) =</b>	1.9422e-3 (2.29e-4)
MW8	1	<b>2.5795e-2 (6.12e-3) =</b>	2.7644e-2 (6.27e-3)
MW9	1	<b>3.6413e-3 (2.38e-3) =</b>	2.4941e-2 (1.19e-1)
MW10	3	1.5467e-2 (1.45e-2) =	<b>1.1114e-2 (8.70e-3)</b>
MW11	4	<b>2.8078e-3 (1.19e-4) =</b>	2.8473e-3 (1.30e-4)
MW12	2	2.3367e-2 (1.13e-1) =	<b>2.7469e-3 (1.02e-4)</b>
MW13	2	2.6975e-2 (1.69e-2) =	<b>2.3951e-2 (1.66e-2)</b>
MW14	1	6.1240e-2 (2.74e-3) =	<b>6.0946e-2 (1.91e-3)</b>
DASCOP1	11	1.1588e-2 (8.90e-3) =	<b>1.0271e-2 (8.15e-3)</b>
DASCOP2	11	6.3442e-3 (4.30e-3) =	<b>5.8622e-3 (7.40e-3)</b>
DASCOP3	11	<b>1.4363e-2 (6.73e-3) =</b>	1.4813e-2 (6.76e-3)
DASCOP4	11	<b>7.7726e-4 (2.02e-4) =</b>	8.3295e-4 (2.42e-4)
DASCOP5	11	2.4530e-3 (2.21e-4) =	<b>2.4027e-3 (2.31e-4)</b>
DASCOP6	11	<b>5.7047e-3 (2.58e-4) =</b>	6.7254e-3 (3.55e-3)
DASCOP7	7	<b>2.4658e-2 (8.70e-4) =</b>	2.4665e-2 (7.20e-4)
DASCOP8	7	1.8953e-2 (8.76e-4) =	<b>1.8900e-2 (7.10e-4)</b>
DASCOP9	7	1.8648e-2 (7.89e-4) =	<b>1.8271e-2 (7.21e-4)</b>
LIRCOP1	2	<b>2.3376e-2 (4.67e-3) =</b>	2.5092e-2 (9.99e-3)
LIRCOP2	2	2.8692e-2 (8.43e-3) -	<b>2.3845e-2 (6.65e-3)</b>
LIRCOP3	3	<b>3.8821e-2 (1.96e-2) +</b>	5.5999e-2 (2.61e-2)
LIRCOP4	3	4.6966e-2 (2.75e-2) =	<b>3.5175e-2 (1.84e-2)</b>
LIRCOP5	2	1.3250e-2 (6.24e-3) =	<b>1.0734e-2 (3.95e-3)</b>
LIRCOP6	2	1.2517e-2 (7.25e-3) =	<b>1.1582e-2 (5.35e-3)</b>
LIRCOP7	3	6.8280e-3 (1.32e-3) =	<b>6.6939e-3 (7.87e-4)</b>
LIRCOP8	3	6.7130e-3 (2.36e-3) =	<b>6.6123e-3 (1.69e-3)</b>
LIRCOP9	2	7.3988e-2 (2.99e-2) -	<b>2.1404e-2 (2.04e-2)</b>
LIRCOP10	2	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0)
LIRCOP11	2	7.2875e-4 (4.08e-4) =	<b>6.2761e-4 (1.36e-4)</b>
LIRCOP12	2	3.7850e-3 (6.28e-3) =	<b>2.3495e-3 (3.50e-3)</b>
LIRCOP13	2	4.3986e-2 (3.09e-3) -	<b>4.0897e-2 (3.09e-3)</b>
LIRCOP14	3	4.6718e-2 (3.66e-3) -	<b>4.3260e-2 (3.27e-3)</b>
+/-/=		1/5/31	

TABLE S-IV  
IGD+ RESULTS (MEAN (STD)) OF CSEMT, CSEMT- $R_1$ , AND CSEMT- $R_2$ , WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	CSEMT- $R_1$	CSEMT- $R_2$	CSEMT
MW1	1	1.1472e-3 (1.22e-5) -	1.1449e-3 (3.01e-5) =	<b>1.1383e-3 (1.60e-5)</b>
MW2	1	<b>1.6500e-2 (7.80e-3) =</b>	1.7675e-2 (9.69e-3) =	1.8055e-2 (1.55e-2)
MW3	2	2.9886e-3 (2.17e-4) -	2.8114e-3 (2.04e-4) =	<b>2.7998e-3 (2.98e-4)</b>
MW4	1	2.9142e-2 (3.49e-4) -	2.8278e-2 (2.41e-4) =	<b>2.8202e-2 (1.78e-4)</b>
MW5	3	<b>3.4130e-4 (1.80e-4) =</b>	6.0873e-4 (7.25e-4) =	4.9719e-4 (8.93e-4)
MW6	1	3.2473e-2 (8.48e-2) =	<b>1.8032e-2 (1.08e-2) =</b>	1.8111e-2 (1.23e-2)
MW7	2	1.8906e-3 (2.53e-4) =	<b>1.8876e-3 (1.88e-4) =</b>	1.9422e-3 (2.29e-4)
MW8	1	<b>2.5729e-2 (6.78e-3) =</b>	2.7724e-2 (7.42e-3) =	2.7644e-2 (6.27e-3)
MW9	1	3.4670e-3 (5.53e-4) +	<b>3.3175e-3 (4.60e-4) =</b>	2.4941e-2 (1.19e-1)
MW10	3	1.2401e-2 (1.32e-2) =	1.1290e-2 (1.10e-2) =	<b>1.1114e-2 (8.70e-3)</b>
MW11	4	<b>2.7723e-3 (1.05e-4) +</b>	2.8108e-3 (1.31e-4) =	2.8473e-3 (1.30e-4)
MW12	2	2.7693e-3 (1.23e-4) =	2.7880e-3 (1.10e-4) =	<b>2.7469e-3 (1.02e-4)</b>
MW13	2	2.8338e-2 (1.38e-2) -	2.4067e-2 (1.40e-2) =	<b>2.3951e-2 (1.66e-2)</b>
MW14	1	6.3321e-2 (2.50e-3) -	6.1279e-2 (2.59e-3) =	<b>6.0946e-2 (1.91e-3)</b>
DASCPOP1	11	1.2159e-2 (8.63e-3) =	<b>6.8874e-3 (6.40e-3) =</b>	1.0271e-2 (8.15e-3)
DASCPOP2	11	7.8524e-3 (6.94e-3) =	9.0797e-3 (1.19e-2) =	<b>5.8622e-3 (7.40e-3)</b>
DASCPOP3	11	1.6189e-2 (1.42e-2) =	1.6733e-2 (6.06e-3) =	<b>1.4813e-2 (6.76e-3)</b>
DASCPOP4	11	<b>7.4735e-4 (1.45e-4) =</b>	9.4124e-4 (4.58e-4) =	8.3295e-4 (2.42e-4)
DASCPOP5	11	2.4573e-3 (2.22e-4) =	2.7158e-3 (3.66e-4) -	<b>2.4027e-3 (2.31e-4)</b>
DASCPOP6	11	<b>5.9153e-3 (4.13e-4) =</b>	6.1667e-3 (5.50e-4) +	6.7254e-3 (3.55e-3)
DASCPOP7	7	<b>2.4433e-2 (9.17e-4) =</b>	2.4691e-2 (8.94e-4) =	2.4665e-2 (7.20e-4)
DASCPOP8	7	<b>1.8825e-2 (8.88e-4) =</b>	1.9199e-2 (7.80e-4) =	1.8900e-2 (7.10e-4)
DASCPOP9	7	1.8725e-2 (6.07e-4) -	1.8608e-2 (6.77e-4) -	<b>1.8271e-2 (7.21e-4)</b>
LIRCPOP1	2	2.6745e-2 (1.82e-2) =	3.4668e-2 (1.39e-2) -	<b>2.5092e-2 (9.99e-3)</b>
LIRCPOP2	2	2.5247e-2 (9.04e-3) =	3.3750e-2 (1.05e-2) -	<b>2.3845e-2 (6.65e-3)</b>
LIRCPOP3	3	<b>4.5577e-2 (3.15e-2) =</b>	9.8372e-2 (5.71e-2) -	5.5999e-2 (2.61e-2)
LIRCPOP4	3	4.0607e-2 (1.97e-2) =	6.0867e-2 (4.01e-2) -	<b>3.5175e-2 (1.84e-2)</b>
LIRCPOP5	2	1.0944e-2 (2.99e-3) =	1.3036e-2 (5.03e-3) -	<b>1.0734e-2 (3.95e-3)</b>
LIRCPOP6	2	<b>8.2142e-3 (1.62e-3) =</b>	9.0688e-3 (2.73e-3) =	1.1582e-2 (5.35e-3)
LIRCPOP7	3	7.3183e-3 (2.71e-3) =	7.1075e-3 (1.92e-3) =	<b>6.6939e-3 (7.87e-4)</b>
LIRCPOP8	3	6.6280e-3 (2.45e-3) =	6.8508e-3 (2.60e-3) =	<b>6.6123e-3 (1.69e-3)</b>
LIRCPOP9	2	2.1581e-2 (1.94e-2) =	<b>1.7038e-2 (1.92e-2) =</b>	2.1404e-2 (2.04e-2)
LIRCPOP10	2	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0)
LIRCPOP11	2	6.2921e-4 (9.92e-5) =	8.6930e-4 (1.03e-3) =	<b>6.2761e-4 (1.36e-4)</b>
LIRCPOP12	2	6.7585e-3 (1.16e-2) =	5.0679e-3 (9.77e-3) =	<b>2.3495e-3 (3.50e-3)</b>
LIRCPOP13	2	4.7069e-2 (4.70e-3) -	4.2353e-2 (3.82e-3) =	<b>4.0897e-2 (3.09e-3)</b>
LIRCPOP14	3	4.8387e-2 (5.49e-3) -	4.3633e-2 (3.17e-3) =	<b>4.3260e-2 (3.27e-3)</b>
+/-/=		2/8/27	1/7/29	

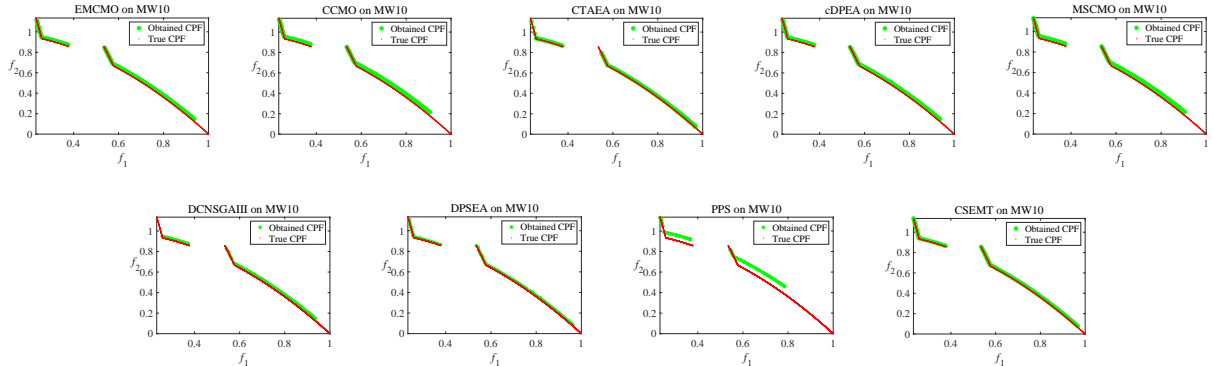


Fig. S-I. Population distribution of compared algorithms on MW10.

TABLE S-V  
MEAN HV RESULTS OF COMPARED ALGORITHMS AND CSEMT ON BENCHMARK FUNCTIONS, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	n	EMCMO	CCMO	CTAEA	cDPEA	MSCMO	DCNSGAI	DPSEA	PPS	CSEMT
MW1	1	4.9007e-1 =	4.9007e-1 =	4.8898e-1 =	<b>4.9009e-1 +</b>	4.8581e-1 =	4.8895e-1 =	4.8956e-1 =	*(8.67e-1) =	4.9007E-01
MW2	1	5.6429e-1 =	5.5865e-1 =	5.5910e-1 =	5.5644e-1 =	5.5004e-1 =	5.5868e-1 =	<b>5.6594e-1 =</b>	5.1593e-1 =	5.5712E-01
MW3	2	5.4477e-1 =	5.4455e-1 =	5.4478e-1 =	5.4432e-1 =	5.4438e-1 =	5.4460e-1 =	5.4415e-1 =	5.4432e-1 =	<b>5.4484E-01</b>
MW4	1	8.4273e-1 =	8.4177e-1 =	8.3813e-1 =	8.4194e-1 =	8.4181e-1 =	8.4131e-1 =	8.4067e-1 =	8.2630e-1 =	<b>8.4293E-01</b>
MW5	3	3.2417e-1 =	3.2408e-1 =	3.1658e-1 =	<b>3.2428e-1 =</b>	*(9.67e-1) =	3.0928e-1 =	3.2401e-1 =	2.7688e-1 =	3.2426E-01
MW6	1	3.0986e-1 =	2.9724e-1 =	3.1128e-1 =	3.0744e-1 =	2.8420e-1 =	3.1063e-1 =	<b>3.1137e-1 =</b>	2.4717e-1 =	3.0514E-01
MW7	2	<b>4.1255e-1 =</b>	4.1235e-1 =	4.0936e-1 =	4.1247e-1 =	4.1219e-1 =	4.1146e-1 =	4.1222e-1 =	4.0785e-1 =	4.1235E-01
MW8	1	<b>5.4274e-1 =</b>	5.3660e-1 =	5.2534e-1 =	5.3958e-1 =	5.2397e-1 =	5.3215e-1 =	5.3514e-1 =	4.6998e-1 =	5.3686E-01
MW9	1	3.9883e-1 +	3.7218e-1 =	3.9311e-1 +	3.9883e-1 +	3.9598e-1 =	3.8488e-1 +	<b>3.9981e-1 +</b>	3.7160e-1 =	3.8334E-01
MW10	3	4.3079e-1 =	4.1888e-1 =	4.3904e-1 =	4.3456e-1 =	4.0394e-1 =	4.2124e-1 =	4.3463e-1 =	*(9.67e-1) =	<b>4.4188E-01</b>
MW11	4	4.4738e-1 =	4.4724e-1 =	4.4256e-1 =	4.4753e-1 =	4.4753e-1 =	4.4270e-1 =	4.4739e-1 =	4.4434e-1 =	4.4743E-01
MW12	2	6.0475e-1 =	6.0477e-1 =	6.0076e-1 =	6.0406e-1 =	5.8257e-1 =	6.0213e-1 =	6.0510e-1 =	6.0303e-1 =	<b>6.0517E-01</b>
MW13	2	4.5615e-1 =	4.4074e-1 =	4.6054e-1 =	<b>4.6337e-1 =</b>	4.3412e-1 =	4.4868e-1 =	4.5672e-1 =	3.9932e-1 =	4.5837E-01
MW14	1	4.7597e-1 =	4.7338e-1 =	4.6732e-1 =	4.7303e-1 =	4.7324e-1 =	4.6523e-1 =	4.7280e-1 =	4.2008e-1 =	<b>4.7617E-01</b>
DASCMOP1	11	1.9098e-1 =	1.8516e-1 =	1.9336e-1 =	1.8629e-1 =	<b>1.9885e-1 +</b>	1.7079e-1 =	1.8437e-1 =	1.4522e-1 =	1.9661E-01
DASCMOP2	11	3.3471e-1 =	3.3632e-1 =	3.4641e-1 +	3.4696e-1 +	<b>3.4860e-1 +</b>	2.9473e-1 =	3.2667e-1 =	2.9796e-1 =	3.4615E-01
DASCMOP3	11	2.9110e-1 =	2.8855e-1 =	<b>3.0580e-1 =</b>	2.9860e-1 =	*(9.67e-1) =	2.5169e-1 =	2.8444e-1 =	2.5847e-1 =	2.9964E-01
DASCMOP4	11	2.0259e-1 =	<b>2.0422e-1 +</b>	1.9259e-1 =	2.0183e-1 =	2.0390e-1 =	1.9767e-1 =	2.0417e-1 +	2.0267e-1 =	2.0382E-01
DASCMOP5	11	3.5073e-1 =	<b>3.5115e-1 +</b>	3.4659e-1 =	3.5042e-1 =	3.5090e-1 =	3.4585e-1 =	3.5093e-1 =	3.4424e-1 =	3.5095E-01
DASCMOP6	11	3.1119e-1 +	3.0851e-1 =	3.0511e-1 =	3.1146e-1 +	3.1127e-1 =	3.1005e-1 =	<b>3.1167e-1 =</b>	3.0677e-1 =	3.1066E-01
DASCMOP7	7	2.8680e-1 =	2.8722e-1 =	2.7848e-1 =	2.8705e-1 =	2.4660e-1 =	2.8060e-1 =	2.8741e-1 =	2.3294e-1 =	<b>2.8750E-01</b>
DASCMOP8	7	2.0576e-1 =	2.0625e-1 =	1.9317e-1 =	2.0583e-1 =	1.6678e-1 =	2.0298e-1 =	2.0629e-1 =	1.6485e-1 =	<b>2.0660E-01</b>
DASCMOP9	7	2.0639e-1 =	2.0645e-1 =	1.9279e-1 =	2.0623e-1 =	1.6172e-1 =	1.8920e-1 =	2.0653e-1 =	1.8440e-1 =	<b>2.0673E-01</b>
LIRCMOP1	2	1.7973e-1 =	1.8039e-1 =	*(9.33e-1) =	2.0479e-1 =	*(9.00e-1) =	2.1580e-1 =	1.6999e-1 =	1.7966e-1 =	<b>2.1881E-01</b>
LIRCMOP2	2	2.9822e-1 =	2.9045e-1 =	2.8578e-1 =	3.1981e-1 =	*(8.33e-1) =	3.3415e-1 =	2.8356e-1 =	3.1758e-1 =	<b>3.4115E-01</b>
LIRCMOP3	3	1.3083e-1 =	1.3248e-1 =	*(7.00e-1) =	1.6827e-1 =	*(5.00e-1) =	<b>1.9213e-1 +</b>	1.5265e-1 =	1.4463e-1 =	1.7512E-01
LIRCMOP4	3	2.3947e-1 =	2.3483e-1 =	*(9.67e-1) =	2.7631e-1 =	*(4.00e-1) =	<b>2.9837e-1 +</b>	2.6616e-1 =	2.5509e-1 =	2.9169E-01
LIRCMOP5	2	2.8545e-1 =	2.8660e-1 =	2.4664e-1 =	2.7959e-1 =	2.6974e-1 =	2.6552e-1 =	2.7994e-1 =	2.4774e-1 =	<b>2.8788E-01</b>
LIRCMOP6	2	1.9283e-1 =	<b>1.9450e-1 =</b>	1.2817e-1 =	1.9169e-1 =	1.8483e-1 =	1.8537e-1 =	1.9130e-1 =	1.7355e-1 =	1.9308E-01
LIRCMOP7	3	2.9088e-1 =	2.8978e-1 =	2.8458e-1 =	2.9028e-1 =	*(9.33e-1) =	2.8529e-1 =	2.9081e-1 =	2.6661e-1 =	<b>2.9285E-01</b>
LIRCMOP8	3	2.9224e-1 =	<b>2.9349e-1 +</b>	2.8422e-1 =	2.9191e-1 =	*(9.00e-1) =	2.8379e-1 =	2.9229e-1 =	2.6969e-1 =	2.9322E-01
LIRCMOP9	2	<b>5.5688e-1 =</b>	5.5612e-1 =	4.9585e-1 =	5.4472e-1 =	5.3771e-1 =	5.5517e-1 =	5.5017e-1 =	5.3275e-1 =	5.5658E-01
LIRCMOP10	2	6.1464e-1 =	6.1478e-1 =	5.8274e-1 =	6.1507e-1 +	6.1459e-1 =	6.1175e-1 =	6.1299e-1 =	<b>6.1624e-1 +</b>	6.1480E-01
LIRCMOP11	2	6.9387e-1 =	6.9392e-1 =	6.3766e-1 =	6.9395e-1 =	6.9388e-1 =	6.9373e-1 =	6.9306e-1 =	6.8860e-1 =	<b>6.9397E-01</b>
LIRCMOP12	2	6.1955e-1 =	6.1991e-1 =	6.0734e-1 =	<b>6.2027e-1 =</b>	6.1819e-1 =	6.1790e-1 =	6.1751e-1 =	6.1733e-1 =	6.1950E-01
LIRCMOP13	2	5.5912e-1 =	5.5403e-1 =	5.4700e-1 =	5.5448e-1 =	5.5484e-1 =	5.5961e-1 =	5.5566e-1 =	5.3493e-1 =	<b>5.5979E-01</b>
LIRCMOP14	3	5.5435e-1 =	5.5315e-1 =	5.4622e-1 =	5.5372e-1 =	5.5271e-1 =	5.5718e-1 =	5.5146e-1 =	5.3669e-1 =	<b>5.5905E-01</b>
+/-/=		2/20/15	3/23/11	2/30/5	5/20/12	2/26/9	3/28/6	2/25/10	1/34/2	

When the algorithm cannot obtain 100% result on the FR indicator, the result is represented by \*(FR).

TABLE S-VI  
IGD+ RESULTS (MEAN (STD)) OF CSEMT USING DIFFERENT  $c$  VALUES, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	CSEMT- $S_2$	CSEMT with $c = 1$	CSEMT with $c = 0.5$	CSEMT with $c = 0.1$	CSEMT with $c = 0.01$	CSEMT with $c = 0.001$
MW1	1	1.1397e-3 (2.74e-5) =	1.1409e-3 (1.74e-5) =	1.1383e-3 (1.60e-5)	<b>1.1350e-3 (1.24e-5) =</b>	1.1414e-3 (1.96e-5) =	1.1448e-3 (2.41e-5) =
MW2	1	1.8476e-2 (8.09e-3) =	<b>1.5597e-2 (1.57e-2) =</b>	1.8055e-2 (1.55e-2)	1.6563e-2 (7.76e-3) =	1.6057e-2 (9.18e-3) =	1.7161e-2 (9.93e-3) =
MW3	2	2.9131e-3 (3.59e-4) =	2.8396e-3 (2.82e-4) =	2.7998e-3 (2.98e-4)	2.8530e-3 (3.69e-4) =	<b>2.7870e-3 (2.14e-4) =</b>	2.8862e-3 (3.16e-4) =
MW4	1	2.8267e-2 (2.25e-4) =	2.8214e-2 (1.85e-4) =	<b>2.8202e-2 (1.78e-4)</b>	2.8285e-2 (2.70e-4) =	2.8307e-2 (2.04e-4) =	2.9012e-2 (5.21e-4) =
MW5	3	1.0461e-3 (9.16e-4) =	4.2242e-4 (2.93e-4) =	4.9719e-4 (8.93e-4)	4.5735e-4 (3.18e-4) =	9.8166e-4 (2.60e-3) =	<b>3.8151e-4 (1.45e-4) =</b>
MW6	1	3.2077e-2 (7.01e-2) =	1.6455e-2 (8.49e-3) =	1.8111e-2 (1.23e-2)	1.6782e-2 (1.01e-2) =	1.6464e-2 (1.16e-2) =	<b>1.6331e-2 (1.09e-2) =</b>
MW7	2	1.9957e-3 (2.05e-4) =	2.0512e-3 (2.75e-4) =	1.9422e-3 (2.29e-4)	1.9632e-3 (2.30e-4) =	1.9277e-3 (2.66e-4) =	<b>1.9246e-3 (1.69e-4) =</b>
MW8	1	2.6155e-2 (4.82e-3) =	<b>2.4923e-2 (6.68e-3) =</b>	2.7644e-2 (6.27e-3)	2.6037e-2 (5.72e-3) =	2.7628e-2 (1.00e-2) =	2.6043e-2 (5.50e-3) =
MW9	1	<b>3.0172e-3 (2.68e-4) =</b>	2.6582e-2 (1.18e-1) =	2.4941e-2 (1.19e-1)	3.3438e-3 (5.25e-4) =	3.0546e-3 (3.44e-4) =	3.0443e-3 (4.66e-4) =
MW10	3	5.2459e-2 (7.14e-2) =	1.2750e-2 (1.03e-2) =	<b>1.1114e-2 (8.70e-3)</b>	1.3788e-2 (9.81e-3) =	1.6202e-2 (1.77e-2) =	1.3856e-2 (1.39e-2) =
MW11	4	2.8781e-3 (8.64e-4) =	<b>2.7948e-3 (1.43e-4) =</b>	2.8473e-3 (1.30e-4)	2.8477e-3 (1.83e-4) =	2.8265e-3 (1.53e-4) =	2.8261e-3 (1.25e-4) =
MW12	2	2.7525e-2 (1.34e-1) =	2.7708e-3 (1.06e-4) =	<b>2.7469e-3 (1.02e-4)</b>	2.7671e-3 (1.38e-4) =	2.7650e-3 (1.12e-4) =	2.7951e-3 (9.40e-5) =
MW13	2	4.0888e-2 (4.18e-2) =	2.6198e-2 (1.83e-2) =	<b>2.3951e-2 (1.66e-2)</b>	2.5505e-2 (1.76e-2) =	2.4808e-2 (1.56e-2) =	2.6455e-2 (1.52e-2) =
MW14	1	<b>6.0910e-2 (2.53e-3) =</b>	6.1388e-2 (2.32e-3) =	6.0946e-2 (1.91e-3)	6.1228e-2 (3.06e-3) =	6.1073e-2 (2.25e-3) =	6.4539e-2 (2.85e-3) =
DASCMP1	11	1.3620e-2 (7.14e-3) =	1.0017e-2 (7.22e-3) =	1.0271e-2 (8.15e-3)	1.0450e-2 (7.54e-3) =	<b>8.5941e-3 (7.01e-3) =</b>	1.2542e-2 (8.61e-3) =
DASCMP2	11	8.9474e-3 (5.66e-3) =	5.9843e-3 (7.38e-3) =	<b>5.8622e-3 (7.40e-3)</b>	6.9502e-3 (7.66e-3) =	9.3842e-3 (9.15e-3) =	8.4240e-3 (6.68e-3) =
DASCMP3	11	2.8068e-2 (1.76e-2) =	1.5850e-2 (6.36e-3) =	<b>1.4813e-2 (6.76e-3)</b>	1.6421e-2 (8.90e-3) =	1.6589e-2 (6.24e-3) =	1.6379e-2 (7.70e-3) =
DASCMP4	11	<b>6.8800e-4 (5.61e-4) +</b>	8.3789e-4 (3.21e-4) =	8.3295e-4 (2.42e-4)	8.4483e-4 (4.44e-4) =	1.4040e-3 (8.21e-4) =	2.7832e-3 (9.01e-4) =
DASCMP5	11	<b>2.1098e-3 (3.86e-4) +</b>	2.4154e-3 (2.41e-4) =	2.4027e-3 (2.31e-4)	2.5375e-3 (2.91e-4) =	2.8587e-3 (3.83e-4) =	3.9827e-3 (3.47e-4) =
DASCMP6	11	8.8034e-3 (5.24e-3) =	6.2083e-3 (2.58e-3) =	6.7254e-3 (3.55e-3)	<b>5.9702e-3 (5.95e-4) =</b>	6.1457e-3 (5.63e-4) +	6.7785e-3 (6.62e-4) =
DASCMP7	7	<b>2.4150e-2 (1.45e-3) =</b>	2.4569e-2 (9.06e-4) =	2.4665e-2 (7.20e-4)	2.4636e-2 (9.30e-4) =	2.5757e-2 (1.45e-3) =	2.8830e-2 (1.09e-3) =
DASCMP8	7	1.9053e-2 (1.22e-3) =	1.9249e-2 (8.29e-4) =	1.8900e-2 (7.10e-4)	<b>1.8832e-2 (6.58e-4) =</b>	1.9907e-2 (1.13e-3) =	2.2202e-2 (1.16e-3) =
DASCMP9	7	<b>1.8179e-2 (5.41e-4) =</b>	1.8403e-2 (6.06e-4) =	1.8271e-2 (7.21e-4)	1.8847e-2 (5.23e-4) =	1.8632e-2 (7.29e-4) =	2.1176e-2 (6.70e-4) =
LIRCMOP1	2	6.7153e-2 (4.11e-2) =	2.5272e-2 (1.26e-2) =	2.5092e-2 (9.99e-3)	2.6981e-2 (2.09e-2) =	2.4636e-2 (9.88e-3) =	<b>2.1642e-2 (4.95e-3) =</b>
LIRCMOP2	2	4.1002e-2 (1.45e-2) =	2.4654e-2 (5.91e-3) =	2.3845e-2 (6.65e-3)	2.4285e-2 (6.60e-3) =	2.4214e-2 (5.87e-3) =	<b>2.2821e-2 (7.74e-3) =</b>
LIRCMOP3	3	9.7959e-2 (5.68e-2) =	5.1806e-2 (3.45e-2) =	5.5999e-2 (2.61e-2)	4.3618e-2 (2.52e-2) =	4.8615e-2 (2.87e-2) =	<b>3.9950e-2 (2.50e-2) +</b>
LIRCMOP4	3	6.7130e-2 (3.98e-2) =	<b>3.3831e-2 (1.87e-2) =</b>	3.5175e-2 (1.84e-2)	4.0509e-2 (2.41e-2) =	3.8000e-2 (2.14e-2) =	3.3969e-2 (1.47e-2) =
LIRCMOP5	2	3.6169e-1 (4.94e-1) =	<b>1.0614e-2 (3.22e-3) =</b>	1.0734e-2 (3.95e-3)	1.1058e-2 (5.40e-3) =	1.1616e-2 (4.30e-3) =	1.1027e-2 (3.39e-3) =
LIRCMOP6	2	3.3130e-1 (4.21e-1) =	8.9933e-3 (2.45e-3) =	1.1582e-2 (5.35e-3)	9.9733e-3 (4.40e-3) =	9.4579e-3 (3.87e-3) =	<b>8.8049e-3 (2.74e-3) =</b>
LIRCMOP7	3	7.3185e-3 (1.44e-3) =	7.0241e-3 (1.28e-3) =	<b>6.6939e-3 (7.87e-4)</b>	7.5770e-3 (2.58e-3) =	7.6478e-3 (2.11e-3) =	7.8538e-3 (2.07e-3) =
LIRCMOP8	3	2.2196e-2 (4.07e-2) =	<b>6.3397e-3 (1.59e-3) =</b>	6.6123e-3 (1.69e-3)	6.4119e-3 (1.05e-3) =	6.7050e-3 (8.84e-4) =	7.2182e-3 (1.31e-3) =
LIRCMOP9	2	9.9719e-2 (1.48e-1) =	2.0019e-2 (1.90e-2) =	2.1404e-2 (2.04e-2)	1.7696e-2 (1.64e-2) =	2.7503e-2 (2.19e-2) =	<b>1.4677e-2 (1.58e-2) =</b>
LIRCMOP10	2	2.1962e-4 (1.20e-3) =	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0)	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0) =
LIRCMOP11	2	2.7404e-3 (9.03e-3) =	7.8312e-4 (4.35e-4) =	<b>6.2761e-4 (1.36e-4)</b>	6.5736e-4 (1.84e-4) =	6.8617e-4 (4.54e-4) =	6.6419e-4 (1.05e-4) =
LIRCMOP12	2	1.5715e-2 (1.68e-2) =	9.6364e-3 (1.31e-2) =	<b>2.3495e-3 (3.50e-3)</b>	6.9786e-3 (1.09e-2) =	2.6564e-3 (5.99e-3) =	2.3898e-3 (4.26e-3) =
LIRCMOP13	2	8.4255e-2 (2.32e-1) =	4.1889e-2 (3.55e-3) =	<b>4.0897e-2 (3.09e-3)</b>	4.0957e-2 (3.16e-3) =	4.1847e-2 (2.67e-3) =	4.9152e-2 (4.10e-3) =
LIRCMOP14	3	4.9226e-2 (4.60e-3) =	<b>4.2959e-2 (2.81e-3) =</b>	4.3260e-2 (3.27e-3)	4.5372e-2 (4.42e-3) =	4.3904e-2 (4.21e-3) =	5.0970e-2 (4.71e-3) =
+/-=		2/20/15	0/1/36		0/1/36	1/8/28	1/16/20

TABLE S-VII  
IGD+ RESULTS (MEAN (STD)) OF CSEMT USING DIFFERENT  $\beta$  VALUES, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	CSEMT with $\beta = 0$	CSEMT with $\beta = 0.2$	CSEMT with $\beta = 0.4$	CSEMT with $\beta = 0.6$	CSEMT with $\beta = 0.8$	CSEMT with $\beta = 1$
MW1	1	1.1413e-3 (1.64e-5) =	1.1377e-3 (2.01e-5) =	1.1460e-3 (2.95e-5) =	<b>1.1342e-3 (1.63e-5) =</b>	1.1383e-3 (1.60e-5)	1.2462e-3 (6.47e-4) -
MW2	1	1.6008e-2 (8.52e-3) =	<b>1.4929e-2 (7.82e-3) =</b>	1.7240e-2 (7.34e-3) =	1.6805e-2 (7.63e-3) =	1.8055e-2 (1.55e-2)	1.5042e-2 (6.29e-3) =
MW3	2	2.8241e-3 (3.08e-4) =	2.8957e-3 (2.67e-4) =	2.8945e-3 (2.65e-4) =	2.8441e-3 (3.06e-4) =	<b>2.7998e-3 (2.98e-4)</b>	2.8336e-3 (3.01e-4) =
MW4	1	2.8356e-2 (2.57e-4) -	2.8307e-2 (2.57e-4) =	2.8268e-2 (1.99e-4) =	2.8240e-2 (1.88e-4) =	<b>2.8202e-2 (1.78e-4)</b>	2.8399e-2 (1.99e-4) -
MW5	3	6.1063e-4 (4.11e-4) -	<b>4.5026e-4 (3.30e-4) =</b>	6.3986e-4 (5.02e-4) -	6.7686e-4 (1.70e-3) =	4.9719e-4 (8.93e-4)	4.7919e-4 (1.51e-4) +
MW6	1	1.7693e-2 (1.07e-2) =	1.7187e-2 (1.82e-2) =	2.2133e-2 (1.01e-2) =	1.8417e-2 (8.78e-3) =	1.8111e-2 (1.23e-2)	<b>1.5171e-2 (8.97e-3) =</b>
MW7	2	<b>1.8688e-3 (1.82e-4) =</b>	1.9078e-3 (1.70e-4) =	1.9003e-3 (1.94e-4) =	1.8969e-3 (1.67e-4) =	1.9422e-3 (2.29e-4)	1.9865e-3 (3.22e-4) =
MW8	1	2.6864e-2 (7.35e-3) =	2.7787e-2 (8.48e-3) =	2.7514e-2 (6.88e-3) =	<b>2.5154e-2 (6.03e-3) =</b>	2.7644e-2 (6.27e-3)	2.6663e-2 (7.62e-3) =
MW9	1	<b>3.1647e-3 (8.20e-4) =</b>	3.2524e-3 (5.35e-4) =	4.6758e-2 (1.66e-1) =	3.5465e-3 (8.82e-4) =	2.4941e-2 (1.19e-1)	2.5048e-2 (1.18e-1) -
MW10	3	1.4145e-2 (1.11e-2) =	1.6787e-2 (1.26e-2) =	NaN (9.67e-1)	2.2867e-2 (3.17e-2) =	<b>1.1114e-2 (8.70e-3)</b>	1.3997e-2 (1.19e-2) =
MW11	4	<b>2.6653e-3 (1.37e-4) +</b>	2.7617e-3 (1.33e-4) +	2.7113e-3 (1.40e-4) +	2.6956e-3 (1.46e-4) +	1.9422e-3 (2.29e-4)	2.8154e-3 (1.31e-4) =
MW12	2	3.0350e-3 (1.21e-4) -	2.7865e-3 (1.25e-4) =	2.7572e-3 (8.33e-5) =	<b>2.7074e-3 (9.65e-5) =</b>	2.7469e-3 (1.02e-4)	2.7664e-3 (1.02e-4) =
MW13	2	<b>1.7486e-2 (1.22e-2) =</b>	2.3969e-2 (1.37e-2) =	2.2998e-2 (1.40e-2) =	2.2194e-2 (1.50e-2) =	2.3951e-2 (1.66e-2)	2.8878e-2 (1.67e-2) =
MW14	1	6.2207e-2 (3.39e-3) =	6.1745e-2 (3.81e-3) =	6.1885e-2 (2.74e-3) =	6.2410e-2 (2.72e-3) =	<b>6.0946e-2 (1.91e-3)</b>	6.1705e-2 (2.45e-3) =
DASCMP1	11	1.0075e-2 (9.04e-3) =	1.8421e-2 (3.78e-2) =	1.0167e-2 (8.06e-3) =	1.0449e-2 (8.31e-3) =	1.0271e-2 (8.15e-3)	<b>8.7701e-3 (8.88e-3) =</b>
DASCMP2	11	6.4942e-3 (7.71e-3) =	6.6640e-3 (5.54e-3) =	<b>5.4741e-3 (3.16e-3) =</b>	7.8467e-3 (6.31e-3) =	5.8622e-3 (7.40e-3)	5.5778e-3 (4.40e-3) =
DASCMP3	11	1.7435e-2 (8.16e-3) =	<b>1.3466e-2 (7.02e-3) =</b>	1.5229e-2 (6.63e-3) =	1.3522e-2 (6.95e-3) =	1.4813e-2 (6.76e-3)	1.4980e-2 (8.97e-3) =
DASCMP4	11	1.2196e-3 (7.76e-4) =	8.8304e-4 (3.77e-4) =	9.1754e-4 (5.93e-4) =	1.0100e-3 (6.07e-4) =	8.3295e-4 (2.42e-4)	<b>8.1833e-4 (3.41e-4) =</b>
DASCMP5	11	2.8970e-3 (2.65e-4) -	2.6796e-3 (2.75e-4) -	2.7280e-3 (3.22e-4) -	2.7288e-3 (3.59e-4) -	<b>2.4027e-3 (2.31e-4)</b>	2.5004e-3 (2.31e-4) =
DASCMP6	11	6.1481e-3 (4.76e-4) +	6.1762e-3 (3.84e-4) +	6.1662e-3 (5.86e-4) +	6.0762e-3 (5.61e-4) +	6.7254e-3 (3.55e-3)	<b>5.9170e-3 (4.72e-4) =</b>
DASCMP7	7	2.5138e-2 (6.95e-4) -	2.4362e-2 (9.86e-4) =	2.4409e-2 (8.80e-4) =	2.4544e-2 (8.51e-4) =	2.4665e-2 (7.20e-4)	<b>2.4345e-2 (9.58e-4) =</b>
DASCMP8	7	1.9799e-2 (9.22e-4) -	1.9035e-2 (9.62e-4) =	1.9103e-2 (8.09e-4) =	<b>1.8867e-2 (7.75e-4) =</b>	1.8900e-2 (7.10e-4)	1.8973e-2 (8.68e-4) =
DASCMP9	7	1.9301e-2 (1.05e-3) -	1.8319e-2 (7.82e-4) =	1.8463e-2 (6.64e-4) =	1.8372e-2 (7.06e-4) =	<b>1.8271e-2 (7.21e-4)</b>	1.8333e-2 (5.57e-4) =
LIRCMP1	2	5.1092e-2 (2.53e-2) =	2.9358e-2 (1.28e-2) =	3.2397e-2 (2.69e-2) =	2.9081e-2 (1.09e-2) -	2.5092e-2 (9.99e-3)	<b>2.3327e-2 (1.00e-2) =</b>
LIRCMP2	2	4.7087e-2 (1.76e-2) -	2.5695e-2 (7.38e-3) =	2.8192e-2 (8.81e-3) =	2.6918e-2 (1.31e-2) =	2.3845e-2 (6.65e-3)	<b>2.3071e-2 (6.73e-3) =</b>
LIRCMP3	3	1.0395e-1 (5.49e-2) -	6.1593e-2 (3.70e-2) =	5.1332e-2 (2.81e-2) =	5.5076e-2 (3.56e-2) =	5.5999e-2 (2.61e-2)	<b>3.6505e-2 (1.84e-2) +</b>
LIRCMP4	3	7.7610e-2 (5.24e-2) -	4.2160e-2 (1.66e-2) =	<b>3.3813e-2 (1.16e-2) =</b>	4.0515e-2 (1.59e-2) =	3.5175e-2 (1.84e-2)	3.7065e-2 (2.39e-2) =
LIRCMP5	2	1.1688e-2 (3.35e-3) =	1.2479e-2 (5.69e-3) =	1.0886e-2 (5.74e-3) =	<b>1.0433e-2 (2.28e-3) =</b>	1.0734e-2 (3.95e-3)	1.4431e-2 (9.47e-3) -
LIRCMP6	2	<b>8.7844e-3 (2.44e-3) =</b>	1.0019e-2 (3.05e-3) =	9.3429e-3 (3.81e-3) =	1.0931e-2 (6.59e-3) =	1.1582e-2 (5.35e-3)	1.0970e-2 (7.42e-3) =
LIRCMP7	3	7.3452e-3 (7.01e-4) -	8.0112e-3 (3.12e-3) =	6.8145e-3 (9.76e-4) =	7.2397e-3 (1.26e-3) =	<b>6.6939e-3 (7.87e-4)</b>	6.8230e-3 (1.02e-3) =
LIRCMP8	3	7.2804e-3 (1.59e-3) -	<b>6.2656e-3 (3.30e-4) =</b>	6.4636e-3 (1.46e-3) =	6.3788e-3 (1.08e-3) =	6.6123e-3 (1.69e-3)	6.4420e-3 (1.04e-3) =
LIRCMP9	2	1.5510e-2 (1.54e-2) =	<b>1.3214e-2 (1.23e-2) =</b>	1.8932e-2 (1.77e-2) =	2.2798e-2 (2.39e-2) =	2.1404e-2 (2.04e-2)	1.8844e-2 (2.21e-2) =
LIRCMP10	2	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0) =	0.0000e+0 (0.00e+0)	0.0000e+0 (0.00e+0) =
LIRCMP11	2	6.8261e-4 (1.06e-4) -	6.8157e-4 (9.46e-5) -	6.9348e-4 (2.05e-4) -	6.7448e-4 (1.18e-4) -	<b>6.2761e-4 (1.36e-4)</b>	6.7715e-4 (2.52e-4) =
LIRCMP12	2	<b>1.2808e-3 (2.26e-3) =</b>	8.4698e-3 (1.07e-2) =	7.7128e-3 (7.73e-3) =	6.8309e-3 (1.18e-2) =	2.3495e-3 (3.50e-3)	5.4366e-3 (9.43e-3) =
LIRCMP13	2	4.1098e-2 (2.41e-3) =	4.1920e-2 (3.09e-3) =	4.1794e-2 (3.41e-3) =	4.2450e-2 (3.58e-3) =	<b>4.0897e-2 (3.09e-3)</b>	4.2442e-2 (3.78e-3) -
LIRCMP14	3	4.7616e-2 (3.06e-3) -	4.7114e-2 (2.81e-3) -	4.7811e-2 (4.88e-3) -	4.6105e-2 (4.35e-3) -	<b>4.3260e-2 (3.27e-3)</b>	4.8254e-2 (5.13e-3) -
+/-/=		2/15/20	2/3/32	2/5/29	1/4/32		2/6/29

TABLE S-VIII  
MEAN IGD+ RESULTS OF ALGORITHMS ON TEN REAL-WORLD PROBLEMS, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	EMCMO	CCMO	CTAEA	cDPEA	MSCMO	DCNSGAIH	DPSEA	PPS	CSEMT
Vibration	5	1.1650e+1 -	1.5454e+1 -	7.9308e+1 -	9.0601e-3 =	1.5457e-2 -	1.6882e-2 -	2.8874e+1 -	1.6062e-2 -	<b>8.4070e-3</b>
Car	10	6.2858e-2 =	6.1239e-2 =	6.0367e-2 =	6.3212e-2 -	6.2306e-2 =	<b>5.6920e-2 +</b>	6.2675e-2 =	9.3410e-2 -	6.1192e-2
BNH	2	1.2794e-1 =	1.4093e-1 -	1.6869e-1 -	1.3786e-1 -	1.3872e-1 -	1.6125e-1 -	1.4121e-1 -	2.2438e-1 -	<b>1.2793e-1</b>
CONSTR	2	6.0935e-3 =	5.8708e-3 +	<b>4.1223e-3 +</b>	6.2420e-3 =	6.1871e-3 =	6.9653e-3 -	6.6464e-3 -	5.0379e-3 +	6.2734e-3
DBD	5	1.0328e-2 -	1.0758e-2 -	1.2590e-2 -	1.0257e-2 =	1.1656e-2 -	1.1021e-2 -	1.0352e-2 -	1.1926e-2 -	<b>9.9135e-3</b>
OSY	6	8.7123e-1 =	1.0663e+0 =	1.9111e+0 -	<b>2.5710e-1 +</b>	3.7869e-1 +	1.3976e+0 -	1.4270e+0 -	2.7055e+1 -	9.6687e-1
SRD	11	1.6946e+0 =	1.7271e+0 -	1.3123e+1 -	1.9542e+0 -	1.7403e+0 -	6.3182e+1 -	1.8645e+0 -	<b>7.7520e-1 +</b>	1.6106e+0
SRN	2	6.2026e-1 =	6.2040e-1 =	7.0574e-1 -	6.4126e-1 -	6.4033e-1 -	3.7055e+1 -	7.2670e-1 -	7.7266e-1 -	<b>6.1679e-1</b>
TNK	2	1.7981e-3 =	1.8361e-3 =	6.7146e-3 -	1.9755e-3 -	*(0.0000e+0) -	2.7071e-3 -	<b>1.7222e-3 +</b>	2.2869e-3 -	1.7966e-3
WB	4	2.5640e-4 =	1.8196e-4 =	6.0180e-3 -	9.8631e-5 +	2.2175e-4 =	1.1488e-3 -	2.2224e-4 =	<b>9.3656e-5 +</b>	1.7856e-4
+/-/=		0/2/8	1/5/4	1/8/1	2/5/3	1/6/3	1/9/0	1/8/1	3/7/0	

TABLE S-IX  
MEAN IGD+ RESULTS OF ALGORITHMS ON THE IES-CM PROBLEM

	EMCMO	CCMO	CTAEA	cDPEA	MSCMO	DCNSGAIH	DPSEA	PPS	CSEMT
IES-CM	1.2966e+02 -	1.4748e+02 -	NaN -	1.8104e+02 -	9.1122e+01 +	1.3311e+02 -	1.6162e+02 -	2.6567e+02 -	1.0469e+02
+/-/=	0/1/0	0/1/0	0/1/0	0/1/0	1/0/0	0/1/0	0/1/0	0/1/0	

TABLE S-X

IGD+ RESULTS (MEAN (STD)) OF CSEMT WITH DIFFERENT NUMBERS OF AUXILIARY POPULATIONS IN THE FIRST STAGE, WHERE  $n$  IS THE NUMBER OF CONSTRAINTS

Problem	$n$	$k = 4$	$k = 6$	$k = 8$	$k = 10$	CSEMT
DASCMP1	11	1.2793e-2 (8.32e-3)	1.2777e-2 (8.39e-3) =	1.2881e-2 (8.01e-3) =	<b>1.0214e-2 (8.24e-3) =</b>	1.0271e-2 (8.15e-3) =
DASCMP2	11	1.1908e-2 (1.18e-2)	7.0449e-3 (4.56e-3) =	8.7688e-3 (9.68e-3) =	7.1635e-3 (6.26e-3) =	<b>5.8622e-3 (7.40e-3) +</b>
DASCMP3	11	2.5710e-2 (2.27e-2)	1.8787e-2 (1.60e-2) =	2.2775e-2 (1.89e-2) =	1.8254e-2 (9.70e-3) =	<b>1.4813e-2 (6.76e-3) =</b>
DASCMP4	11	<b>6.0504e-4 (4.92e-5)</b>	6.3395e-4 (8.38e-5) =	6.7074e-4 (1.41e-4) -	7.2320e-4 (1.46e-4) -	8.3295e-4 (2.42e-4) -
DASCMP5	11	<b>2.1553e-3 (1.83e-4)</b>	2.2518e-3 (1.72e-4) -	2.2942e-3 (2.05e-4) -	2.2901e-3 (1.80e-4) -	2.4027e-3 (2.31e-4) -
DASCMP6	11	7.9263e-3 (8.02e-3)	6.0302e-3 (2.52e-3) =	<b>5.6087e-3 (2.60e-4) =</b>	6.1807e-3 (2.54e-3) =	6.7254e-3 (3.55e-3) =
DASCMP7	7	2.4413e-2 (9.56e-4)	<b>2.4205e-2 (1.01e-3) =</b>	2.4387e-2 (8.37e-4) =	2.4497e-2 (1.02e-3) =	2.4665e-2 (7.20e-4) =
DASCMP8	7	1.9077e-2 (7.56e-4)	<b>1.8872e-2 (6.96e-4) =</b>	1.9162e-2 (9.65e-4) =	1.8941e-2 (9.98e-4) =	1.8900e-2 (7.10e-4) =
DASCMP9	7	<b>1.8208e-2 (5.90e-4)</b>	1.8228e-2 (6.17e-4) =	1.8468e-2 (6.17e-4) =	1.8516e-2 (8.71e-4) =	1.8271e-2 (7.21e-4) =
+/-/=		0/1/8		0/2/7	0/2/7	1/2/6

TABLE S-XI

MEAN IGD+ RESULTS OF COMPARED ALGORITHMS AND CSEMT ON LIRCMOP4 VARIANT FUNCTIONS

	EMCMO	CCMO	CTAEA	cDPEA	MSCMO	DCNSGAI	DPSEA	PPS	CSEMT
LIRCMOP4_s1	1.4405e-02 -	9.1820e-03 =	2.4548e-02 -	1.1269e-02 -	3.7283e-02 -	2.1645e-02 -	1.1376e-02 -	6.2998e-02 -	<b>6.9932e-03</b>
LIRCMOP4_s2	1.6068e-02 -	1.5094e-02 =	4.1289e-02 -	1.4328e-02 =	1.0562e-01 -	2.7704e-02 -	1.3717e-02 =	8.1540e-02 -	<b>1.2566e-02</b>
LIRCMOP4_s3	7.3652e-02 -	8.1629e-02 -	8.6351e-02 -	5.1569e-02 -	*(8.3330e-01) -	2.6350e-02 -	1.0351e-01 -	5.6555e-02 -	<b>2.4684e-02</b>
LIRCMOP4_s12	2.0634e-03 =	<b>2.0265e-03 =</b>	8.1900e-03 -	2.1991e-03 -	4.1705e-03 -	4.5093e-03 -	2.8391e-03 -	2.1793e-03 -	2.0750e-03
LIRCMOP4_s13	7.5407e-03 -	7.0550e-03 -	1.8089e-02 -	7.3210e-03 -	1.4722e-02 -	2.5638e-02 -	6.8878e-03 =	2.8305e-02 -	<b>6.6294e-03</b>
LIRCMOP4_s23	9.0523e-03 =	9.1459e-03 =	3.1777e-02 -	<b>8.8439e-03 =</b>	1.8337e-02 -	2.7450e-02 -	9.1207e-03 =	3.2056e-02 -	1.0058e-02
LIRCMOP4	9.1882e-02 -	1.0630e-01 -	*(9.6700e-01) -	5.6523e-02 -	*(4.0000e-01) -	<b>2.3245e-02 +</b>	6.7590e-02 -	9.1752e-02 -	3.3885e-02
+/-/=		0/5/2	0/3/4	0/7/0	0/5/2	0/7/0	1/6/0	0/4/3	0/7/0