Table 1: The Summary of Benchmark Problems, including the function number, equation, bounded constrained, dimension, relative methods, and optimal value.

f	Function equation	Bounded cons. and function name	Dim. No.	reference and methods	Optimal val.
1	$f_1 = \sum_{1}^{3} x_i^2$	$-100 \le x_i \le 100$ sphere(quadratic)	3	GA [1,16,11,17,18, 19,24,25] RCGA [1,14,19,25] ES [11]	0 [0,0,0]
2	$f_2 = \sum_{i=1}^{n-1}[100(x_i^2 - x_{i+1})^2 + (1 - x_i)^2]$	$-2.048 \le x_i \le 2.048$ Rosenbrock	2	as function 1	0 [1,1]
3	$f_3(x) = \sum_{i=1}^{5} integer(x_i)$	$-5.12 \le x_i \le 5.12$ De Jong step func.	5	as function 1	0 [0,0,0,0,0]
4	$f_4(x) = \sum_{i=1}^{30} ix_i^4 + Gauss(0,1)$	$-1.28 \le x_i \le 1.28$ De Jong step func. 4	30	as function 1	0 [0, . . . ,0]
5	$f_5(x) = 0.002 + \sum_{j=1}^{25} \frac{1}{j + \sum_{i=1}^{2}(x_i - a_{ji})^6}$	$-65.536 \le x_i \le 65.536$ Shekel's Foxholes	2	as function 1	0.9980038 [-31.9784576, -31.9786271]
6	$f_6(x) = (x_1^2 + x_2^2)^{0.25}[\sin^2(50(x_1^2 + x_2^2)^{0.1}) + 1.0]$	$-100 \le x_i \le 100$ Schaffer	2	GA [1,16,19,6] RCGA [1,19]	0 [0,0]
7	$f_7(x) = (x_1^2 + x_2^2)/2 - \cos(20\pi x_1)\cos(20\pi x_2) + 2$	$-10 \le x_i \le 10$	2	EP+SA [10]	1 [0,0]
8	$f_8(x) = \sum_{i=1}^{n} x_i^2$	$-30 \le x_i \le 30$ Sphere model	30	GA [22], ES[22,20], EP [22]	0
9	$f_9(x) = \sum_{i=1}^{n}(x_i + 0.5)^2$	$-30 \le x_i \le 30$ Schwefel	30	GA [22], ES[22,20], EP [22]	0
10	$f_{10} = -20\exp(-0.2(1/n\sum_{i=1}^{n} x_i^2)^{1/2}) - \exp(1/n\sum_{i=1}^{n}\cos(2\pi x_i)) + 20 + e$	$-30 \le x_i \le 30$ Ackley	30	GA [22], ES[22,20], EP [22]	0 [0, . . . ,0]
11	$f_{11} = 10n + \sum_{i=1}^{n}(x_i^2 - 10\cos(2\pi x_i))$	$-5.12 \le x_i \le 5.12$ Rastrigin	20	GA [11,18,24,25] RCGA [19,15,25] ES [11]	0 [0, . . . ,0]
12	$f_{12} = \sum_{i=1}^{n} -x_i \sin(\sqrt{\lvert x_i \rvert})$	$-500 \le x_i \le 500$ Schwefel	10	GA [18,24,25] RCGA [14,15,25]	-418.98288n [420.9687, . . . , 420.9867]
13	$f_{13} = 1 + \sum_{i=1}^{n}\frac{x_i^2}{4000} - \prod_{i=1}^{n}\cos(x_i/\sqrt{i})$	$-600 \le x_i \le 600$ Griewangk	10	GA [18,24,25] RCGA [19,15,25] det. [2,28]	0 [0, . . . ,0]
14	$f_{14} = \sum_{i=1}^{n}(\sum_{j=1}^{i} x_j)^2$	$-30 \le x_i \le 30$ Schwefel's pro. 1.2	20	GA [25], RCGA [25] ES [11,26]	0 [0, . . . ,0]
15	$f_{15} = \sum_{i=1}^{n-1}[100(x_i^2 - x_{i+1})^2 + (1 - x_i)^2]$	$-5.12 \le x_i \le 5.12$ Rosenbrock	10	GA [9] EP [7]	0 [1, . . . ,1]
16	$f_{16}(x) = \sum_{i=1}^{n-1}(x_i^2 + 2x_{i+1}^2 - 0.3\cos(3\pi x_i) - 0.4\cos(4\pi x_{i+1}) + 0.7)$	$-5.12 \le x_i \le 5.12$ Bohachevsky	10	EP [7]	0 [0, . . . ,0]
17	$f_{17}(x) = x_n + \sum_{i=1}^{n-1}(x_i^2 + \mu_i^2)$ *subject to* $x_{i+1} = x_i + \mu_i, j = 0, 1, \ldots, n-1$	$-200 \le x_i \le 200$ dynamic control problem	45	GA [3,19,25] RCGA [3,19,25]	16180.340452