Table 14. One-way ANOVA for all test problems (between groups).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Metric | Problem size | Sum of squares | df | Mean square | F | Sig. |
|  | Small | 211.900 | 4 | 52.975 | 1.121 | 0.362 |
| NPS | Medium | 2991.850 | 4 | 747.962 | 4.783 | 0.003 |
|  | Large | 4137.600 | 4 | 1034.400 | 8.895 | <0.001 |
|  | Small | 0.060 | 4 | 0.015 | 0.770 | 0.552 |
| MID | Medium | 0.219 | 4 | 0.055 | 3.664 | 0.014 |
|  | Large | 0.927 | 4 | 0.232 | 14.466 | <0.001 |
|  | Small | 33.854 | 4 | 8.463 | 0.010 | 1.000 |
| DM | Medium | 11327.664 | 4 | 2831.916 | 0.595 | 0.669 |
|  | Large | 357820.973 | 4 | 89455.243 | 7.653 | <0.001 |
|  | Small | 0.033 | 4 | 0.008 | 1.367 | 0.265 |
| SNS | Medium | 0.164 | 4 | 0.041 | 6.834 | <0.001 |
|  | Large | 0.151 | 4 | 0.038 | 4.867 | 0.003 |
|  | Small | 15.848 | 4 | 3.962 | 0.499 | 0.737 |
| RAS | Medium | 27.733 | 4 | 6.933 | 0.689 | 0.604 |
|  | Large | 74.551 | 4 | 18.638 | 0.231 | 0.919 |
|  | Small | 6.822 | 4 | 1.705 | 60.371 | <0.001 |
| QM | Medium | 2.814 | 4 | 0.704 | 17.066 | <0.001 |
|  | Large | 3.720 | 4 | 0.930 | 22.97 | <0.001 |

Inside Subsets are in order, subset 3 is the best

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Metric | Problem size | Order of best performance | | |
| Subset 1 | Subset 2 | Subset 3 |
|  | Small | **Hybrid\*** – SPEA-II – PESA-II – NSGA-II – MOEA/D |  |  |
| NPS | Medium | MOEA/D | **Hybrid\* & SPEA-II\*** – PESA-II – NSGA-II |  |
|  | Large | MOEA/D | Hybrid – PESA-II – NSGA-II | **SPEA-II\*** – Hybrid |
|  |  |  |  |  |
|  | Small | **SPEA-II\*** – PESA-II – NSGA-II – Hybrid – MOEA/D |  |  |
| MID | Medium | MOEA/D – Hybrid | SPEA-II – PESA-II – MOEA/D | **NSGA-II\*** – SPEA-II – PESA-II |
|  | Large | MOEA/D – Hybrid | **SPEA-II\*** – NSGA-II – PESA-II |  |
|  |  |  |  |  |
|  | Small | **Hybrid\*** – SPEA-II – PESA-II – NSGA-II – MOEA/D |  |  |
| DM | Medium | **Hybrid\*** – NSGA-II – SPEA-II – MOEA/D – PESA-II |  |  |
|  | Large | SPEA-II – NSGA-II – PESA-II – MOEA/D | **Hybrid\*** |  |
|  |  |  |  |  |
|  | Small | NSGA-II – SPEA-II – PESA-II – Hybrid | **MOEA/D\*** – NSGA-II – SPEA-II – PESA-II |  |
| SNS | Medium | NSGA-II – SPEA-II – PESA-II – Hybrid | **MOEA/D\*** |  |
|  | Large | Hybrid | **MOEA/D II\*** – SPEA-II – NSGA-II – PESA-II |  |
|  |  |  |  |  |
|  | Small | **Hybrid\*** – MOEA/D – NSGA-II – PESA-II – SPEA-II |  |  |
| RAS | Medium | **MOEA/D\*** – Hybrid – PESA-II– NSGA-II – SPEA-II |  |  |
|  | Large | **Hybrid\*** – MOEA/D – PESA-II – SPEA-II – NSGA-II |  |  |
|  |  |  |  |  |
|  | Small | MOEA/D – Hybrid | **NSGA-II\*** – PESA-II – SPEA-II |  |
| QM | Medium | MOEA/D – Hybrid | **SPEA-II\*** – PESA-II – NSGA-II |  |
|  | Large | MOEA/D & Hybrid | NSGA-II – PESA-II | **SPEA-II\*** |

**\*Best performance**