Phase 1: Initialization

**1.1. Choose the Test Problems for Tuning**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Row |  |  | Items | Knapsack | P. No. | Rate |  |
| 1 | Group 1 | 01\_10 | 100 | 5 | 10 |  |  |
| 2 | Group 1 | 03\_10 | 100 | 10 | 10 |  |  |
| 3 | Group 1 | 07\_10 | 100 | 30 | 10 |  |  |
|  |  |  |  |  |  |  |  |
| 4 | Group 2 | mknapcb2 | 250 | 5 | 10 |  |  |
| 5 | Group 2 | mknapcb5 | 250 | 10 | 10 |  |  |
| 6 | Group 2 | mknapcb8 | 250 | 30 | 10 |  |  |
|  |  |  |  |  |  |  |  |
| 7 | Group 3 | mknapcb4 | 500 | 5 | 10 |  |  |
| 8 | Group 3 | mknapcb6 | 500 | 10 | 10 |  |  |
| 9 | Group 3 | mknapcb9 | 500 | 30 | 10 |  |  |

1.2. Choose the Parameters and Their Ranges

Categorical:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Row | Parameter | Unit | Type 1 | Type 2 |
| 1 | Crossover\_type | Type | One\_point | Uniform |
| 2 | Selection\_Type | Type | Roulette Wheel | Tournoment |

Numerical:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Row | Parameter | Unit | Low1 | High1 | Low1 | High1 | Low1 | High1 |
| 1 | Bee\_num | Number | 100 | 300 | 200 | 600 | 300 | 900 |
| 2 | max\_improvement\_try | Number | 100 | 300 | 200 | 600 | 300 | 900 |
| 3 | Pc\_One\_Point | Percent | 0.50 | 0.90 | 0.50 | 0.90 | 0.50 | 0.90 |
| 4 | Pc\_Uniform | Percent | 0.50 | 0.90 | 0.50 | 0.90 | 0.50 | 0.90 |
| 5 | Pm | Percent | 0.008 | 0.08 | 0.008 | 0.08 | 0.008 | 0.08 |
| 6 | K\_Tournoment | Number | 2 | 8 | 2 | 8 | 2 | 8 |

Running time:

|  |  |  |
| --- | --- | --- |
|  | Run time (second) |  |
| Group 1 | 600 |  |
| Group 2 | 1200 |  |
| Group 3 | 1800 |  |

1.3. Select the Responses

Gap percent from best known solution.

**Phase 2: Response Surface Modeling**

**2.1. Design Experiments**