# Results for instances from collection
## TeamFormation-QKP-2

# File Synthetic_TF_01000.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 13.4 % |
| Edges ($m$) | 67,159 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 31.9 | **0.00** | 32.21 | 5.14 | — | — | — | **0.00** | **0.00** | **0.00** | 2.1 | 5.6 | 120.0 | 120.0 | 120.0 | 7.2 | 120.0 |
| 5.0 | 57.6 | **0.00** | 36.14 | 9.26 | — | — | — | **0.00** | **0.00** | **0.00** | 4.6 | 5.3 | 120.0 | 120.0 | 120.0 | 10.6 | 120.0 |
| 10.0 | 104.5 | 0.05 | 23.69 | 9.58 | — | — | — | **0.00** | 3.18 | **0.01** | 8.6 | 8.5 | 120.0 | 120.0 | 120.0 | 11.7 | 120.0 |
| 25.0 | 229.6 | 0.07 | 10.29 | 4.78 | — | — | — | **0.00** | 1.24 | **0.01** | 20.3 | 8.9 | 120.0 | 120.0 | 120.0 | 42.5 | 120.0 |
| 50.0 | 418.1 | 0.02 | 1.91 | 0.69 | — | — | — | **0.00** | 0.09 | **0.01** | 30.2 | 11.7 | 120.0 | 120.0 | 120.0 | 29.6 | 120.0 |
| 75.0 | 573.0 | **0.00** | 1.02 | 0.17 | — | — | — | **0.00** | 0.04 | **0.01** | 38.5 | 9.9 | 120.0 | 120.0 | 120.0 | 19.9 | 120.0 |
| Avg | | 0.02 | 17.54 | 4.94 | — | — | — | **0.00** | 0.76 | **0.01** | 17.4 | 8.3 | 120.0 | 120.0 | 120.0 | 20.3 | 120.0 |
| Min | | **0.00** | 1.02 | 0.17 | — | — | — | **0.00** | **0.00** | **0.00** | 2.1 | 5.3 | 120.0 | 120.0 | 120.0 | 7.2 | 120.0 |
| Max | | 0.07 | 36.14 | 9.58 | — | — | — | **0.00** | 3.18 | **0.01** | 38.5 | 11.7 | 120.0 | 120.0 | 120.0 | 42.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 105 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.1205 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.0930 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0109 |

# File Synthetic_TF_02000.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 12.4 % |
| Edges ($m$) | 247,696 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 116.5 | 0.50 | 33.47 | 14.67 | — | — | — | **0.00** | 10.16 | **0.03** | 11.6 | 14.9 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 5.0 | 208.5 | **0.00** | 20.95 | 12.81 | — | — | — | 60.42 | 10.33 | **0.03** | 24.7 | 19.8 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| 10.0 | 372.3 | **0.00** | 14.13 | 7.54 | — | — | — | 114.20 | 4.19 | **0.03** | 57.1 | 40.7 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 25.0 | 838.3 | **0.00** | 4.25 | 4.75 | — | — | — | 96.26 | 0.50 | **0.06** | 120.0 | 33.4 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| 50.0 | 1,598.5 | **0.00** | 1.88 | 0.55 | — | — | — | 44.52 | 0.21 | **0.05** | 120.0 | 37.1 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 75.0 | 2,236.5 | **0.00** | 0.19 | **0.00** | — | — | — | 0.01 | 0.05 | **0.06** | 120.1 | 33.7 | 120.0 | 120.0 | 120.0 | 115.9 | 120.0 |
| Avg | | **0.08** | 12.48 | 6.72 | — | — | — | 52.57 | 4.24 | **0.04** | 75.6 | 29.9 | 120.0 | 120.0 | 120.0 | 119.7 | 120.0 |
| Min | | **0.00** | 0.19 | **0.00** | — | — | — | **0.00** | 0.05 | **0.03** | 11.6 | 14.9 | 120.0 | 120.0 | 120.0 | 115.9 | 120.0 |
| Max | | **0.50** | 33.47 | 14.67 | — | — | — | 114.20 | 10.33 | **0.06** | 120.1 | 40.7 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 85 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.4372 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2350 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0125 |

# File Synthetic_TF_04000.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 4,000 |
| Density ($\Delta$) | 12.7 % |
| Edges ($m$) | 1,014,045 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 391.4 | **0.00** | 46.76 | 39.27 | — | — | — | 2,355.68 | 11.12 | **0.08** | 120.0 | 77.2 | 120.0 | 120.0 | 120.0 | 121.0 | 122.0 |
| 5.0 | 702.4 | **0.00** | 28.31 | 16.59 | — | — | — | 636.16 | 5.50 | **0.14** | 120.0 | 103.6 | 120.0 | 120.0 | 120.0 | 120.8 | 122.0 |
| 10.0 | 1,285.4 | **0.00** | 10.73 | 3.22 | — | — | — | 262.20 | 3.74 | **0.30** | 120.1 | 133.6 | 120.0 | 120.0 | 120.0 | 120.6 | 122.0 |
| 25.0 | 3,149.7 | **0.00** | 2.15 | 1.11 | — | — | — | 118.24 | 2.36 | **0.35** | 120.3 | 134.1 | 120.0 | 120.0 | 120.0 | 120.6 | 122.0 |
| 50.0 | 6,177.7 | **0.00** | 0.50 | 0.24 | — | — | — | 49.29 | 1.60 | **0.24** | 120.5 | 134.5 | 120.0 | 120.0 | 120.0 | 120.9 | 122.0 |
| 75.0 | 8,717.6 | **0.00** | 0.11 | 0.07 | — | — | — | 17.27 | 0.60 | **0.28** | 120.5 | 134.8 | 120.0 | 120.0 | 120.0 | 120.5 | 122.0 |
| Avg | | **0.00** | 14.76 | 10.08 | — | — | — | 573.14 | 4.15 | **0.23** | 120.2 | 119.6 | 120.0 | 120.0 | 120.0 | 120.7 | 122.0 |
| Min | | **0.00** | 0.11 | 0.07 | — | — | — | 17.27 | 0.60 | **0.08** | 120.0 | 77.2 | 120.0 | 120.0 | 120.0 | 120.5 | 122.0 |
| Max | | **0.00** | 46.76 | 39.27 | — | — | — | 2,355.68 | 11.12 | **0.35** | 120.5 | 134.8 | 120.0 | 120.0 | 120.0 | 121.0 | 122.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 119 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.6704 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.5620 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0189 |

# File Synthetic_TF_06000.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 6,000 |
| Density ($\Delta$) | 12.5 % |
| Edges ($m$) | 2,257,990 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 655.8 | **0.00** | 28.88 | 17.89 | — | — | — | — | 19.22 | **0.26** | 120.0 | 151.9 | 120.0 | 120.0 | 120.0 | 121.7 | 120.0 |
| 5.0 | 1,284.3 | **0.00** | 13.75 | 8.70 | — | — | — | — | 6.41 | **0.31** | 120.2 | 151.9 | 120.0 | 120.0 | 120.0 | 122.2 | 120.0 |
| 10.0 | 2,666.5 | **0.00** | 6.91 | 3.21 | — | — | — | — | 7.67 | **0.58** | 120.3 | 152.1 | 120.0 | 120.0 | 120.0 | 121.3 | 120.0 |
| 25.0 | 6,866.4 | **0.00** | 1.31 | 0.74 | — | — | — | — | 4.20 | **0.82** | 120.9 | 153.3 | 120.0 | 120.0 | 120.0 | 121.4 | 120.0 |
| 50.0 | 13,690.7 | **0.00** | 0.52 | 0.35 | — | — | — | — | 3.25 | **0.56** | 120.0 | 153.3 | 120.0 | 120.0 | 120.0 | 122.5 | 120.0 |
| 75.0 | 19,597.2 | **0.00** | 0.01 | **0.00** | — | — | — | — | 1.59 | **0.68** | 121.4 | 152.9 | 120.0 | 120.0 | 120.0 | 120.8 | 120.0 |
| Avg | | **0.00** | 8.56 | 5.15 | — | — | — | — | 7.06 | **0.54** | 120.5 | 152.6 | 120.0 | 120.0 | 120.0 | 121.7 | 120.0 |
| Min | | **0.00** | 0.01 | **0.00** | — | — | — | — | 1.59 | **0.26** | 120.0 | 151.9 | 120.0 | 120.0 | 120.0 | 120.8 | 120.0 |
| Max | | **0.00** | 28.88 | 17.89 | — | — | — | — | 19.22 | **0.82** | 121.4 | 153.3 | 120.0 | 120.0 | 120.0 | 122.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 97 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 3.9013 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 1.0780 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0247 |

# File Synthetic_TF_08000.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 8,000 |
| Density ($\Delta$) | 12.6 % |
| Edges ($m$) | 4,023,218 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,228.3 | **0.00** | 33.13 | 33.92 | — | — | — | | 17.52 | **0.36** | 120.1 | 176.9 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| 5.0 | 2,327.9 | **0.00** | 21.44 | 7.89 | — | — | — | | 14.59 | **0.50** | 120.3 | 179.4 | 120.0 | 120.0 | 120.0 | 120.7 | 120.0 |
| 10.0 | 4,702.1 | **0.00** | 7.76 | 3.05 | — | — | — | | 9.56 | **1.27** | 120.2 | 179.4 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| 25.0 | 12,082.6 | **0.00** | 1.78 | 0.61 | — | — | — | | 7.91 | **1.84** | 121.5 | 180.6 | 120.0 | 120.0 | 120.0 | 120.7 | 120.0 |
| 50.0 | 24,278.8 | **0.00** | 0.25 | 0.07 | — | — | — | | 6.17 | **1.15** | 120.6 | 176.6 | 120.0 | 120.0 | 120.0 | 120.7 | 120.0 |
| 75.0 | 34,905.1 | **0.00** | 0.04 | 0.03 | — | — | — | | 3.44 | **1.24** | 121.2 | 180.1 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| Avg | | **0.00** | 10.73 | 7.59 | — | — | — | | 9.87 | **1.06** | 120.6 | 178.8 | 120.0 | 120.0 | 120.0 | 120.7 | 120.0 |
| Min | | **0.00** | 0.04 | 0.03 | — | — | — | | 3.44 | **0.36** | 120.1 | 176.6 | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| Max | | **0.00** | 33.13 | 33.92 | — | — | — | | 17.52 | **1.84** | 121.5 | 180.6 | 120.0 | 120.0 | 120.0 | 120.7 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 103 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 6.9732 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 1.7960 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0303 |

# File Synthetic_TF_10000.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 10,000 |
| Density ($\Delta$) | 12.8 % |
| Edges ($m$) | 6,383,021 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,827.9 | **0.00** | 33.38 | 30.16 | — | — | — | — | 35.04 | **0.77** | 120.2 | 207.5 | 120.0 | 120.0 | 120.0 | 121.0 | 120.0 |
| 5.0 | 3,518.4 | **0.00** | 18.66 | 11.36 | — | — | — | — | 24.63 | **0.77** | 120.8 | 206.9 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |
| 10.0 | 7,107.6 | **0.00** | 6.87 | 1.42 | — | — | — | — | 16.32 | **2.01** | 120.8 | 206.5 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |
| 25.0 | 18,590.7 | **0.00** | 1.41 | 0.13 | — | — | — | — | 13.95 | **3.27** | 123.2 | 212.8 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |
| 50.0 | 37,621.3 | **0.00** | 0.27 | 0.04 | — | — | — | — | 12.32 | **1.88** | 123.3 | 214.2 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |
| 75.0 | 54,050.1 | **0.00** | 0.03 | 0.01 | — | — | — | — | 7.12 | **2.57** | 124.9 | 207.0 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |
| Avg | | **0.00** | 10.10 | 7.19 | — | — | — | — | 18.23 | **1.88** | 122.2 | 209.2 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |
| Min | | **0.00** | 0.03 | 0.01 | — | — | — | — | 7.12 | **0.77** | 120.2 | 206.5 | 120.0 | 120.0 | 120.0 | 121.0 | 120.0 |
| Max | | **0.00** | 33.38 | 30.16 | — | — | — | — | 35.04 | **3.27** | 124.9 | 214.2 | 120.0 | 120.0 | 120.0 | 121.1 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 103 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 11.0509 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 2.8600 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0389 |