Prílohy

Príloha A - Kód pre výpočet úlohy CVRP

```
$ontext
M_transit_ZA_V2
$offtext
sets
i uzol /1*16/
subi(i) /2*16/
alias (i,j)
alias (subi, subj);
set ij1(i,j)/1*16.1*16/
ij2(i,j)/2*16.2*16/
ij3(i,j)/1.1,2.2,3.3,4.4,5.5,6.6,7.7,8.8,9.9,10.10,11.11,12.12,13.13,14.14,15.15,16.16/
ij4(i,j)
ij5(i,j);
ij4(i,j)=ij1(i,j)-ij3(i,j);
ij5(i,j)=ij2(i,j)-ij3(i,j);
table d(i,j)
          1          2          3          4          5          6          7          8          9          10          11          12
13          14          15          16
1          0   604.202612   1861.9881   1469.07684  4713.168114   4414.37975   6149.2608   5540.08054
7188.3616   11958.7128   6008.227821  4239.020571   5578.91019   2638.89846    4275.531   4214.41705
2    1572.8913          0   1305.99405   2219.55404   13526.0534   4085.50932    5909.072   5209.04198
6422.2184   7720.5135   5569.464423  3701.181567   5177.13336   2209.54979   3749.00778   3692.87292
3    3501.0507    2232.5085          0  1528.595064   4384.1952   4953.92676   9622.5984    6241.7844
5835.19716   9957.9675   5187.315657  3215.61681   6028.93872   1422.54668   2964.30737   2533.51462
4    2339.4756   3712.20448  4845.153456          0  5795.922951   5506.55604   7122.2826   6458.37738
7441.6482   10045.4224   6150.50916   4291.9371   7003.25495    2954.536   1621.61346   4580.23419
5   12358.0629  11432.49408  10850.01456  15417.50301          0  2442.09812   2752.65306   2289.7654
3572.85357   4303.60746   1252.598733   3870.5074   6376.51542   3821.68279    7345.143   3632.52864
6  13079.34205  11857.33053  14276.39808  15531.07905   6048.03584          0  1573.20192   1030.36467
5074.41558   6882.54826   11148.3392   6169.90128    8732.04    4832.512   6704.25074   5955.74141
7  15799.54464   14736.864   13877.7018   18514.9788   6446.59956   3200.96064          0   535.941262
4231.47378   5067.5644   3171.55959   6489.45792   7121.9824   6008.47933   8012.2302  17496.38748
8  14902.65372  13440.95802  16155.28716  17462.16628   5627.1014   2394.63533   826.693204          0
4062.487   4605.45414   3411.031578   6038.80112   6626.21463   5533.22624   7052.4563   4477.02725
9  20800.1171   18598.112  17269.34092   22532.328  6863.49378  11915.68524  10836.9768   9169.4185
0   1194.8853   2624.56367   6033.83964   7836.95853   6323.54344   8335.3535   5015.32486
10   20638.4778    20410.4645    17292.0325    23039.5016    8902.67178   14007.76062    12834.9448
11990.65574    1655.1147          0   3682.23156   7371.96642    9055.303    7520.91    9430.2978
6177.97236
11  17010.49608   15980.08222   14390.40993    18481.4274    3260.53116    8687.10773    9964.38405
9073.54878   3731.26735   5811.93638          0   3764.40516    6395.025   5162.0688   7092.91275
3647.80854
12  10873.01206    9423.08451    6329.83575   11282.57946    6763.7624   12047.11146   12990.80376
12187.8427  11241.16036  12992.82075    7718.07176          0   2483.2512   2606.78334   4862.21013
776.79392
13  13854.15777    12502.0476    9430.86832   14382.93918    10299.7692        15191.4    17618.4424
16853.40006  15688.04147   17550.7071    11010.776    3452.1552          0   5392.09968   7286.20602
3298.20348
14   5506.8543   4111.69674   1981.55046    6507.184   9778.82755   14629.208  18447.45728  17859.83824
16767.252    18421.08    11520.5013   4822.34382   7878.95328          0   1995.81176   1878.13494
15   7676.38404    6340.42227    4086.4866    4388.37266   13404.02268   17902.49329    21867.5574
18877.1222   20286.5152   21760.9469   15086.37075   7757.61825  11275.26453   3007.77816          0
3739.89945
```

```
16 8946.5711 7768.99822 5672.2253 10071.0939 6823.45248 11922.57521 14473.407
13843.09925 12599.28635 14431.4196 7655.84142 923.20608 4276.79652 4110.65124 6725.3349
0;

scalar g /716/;
parameters q(j);
q['2'] = 279  ;
q['3'] = 243  ;
q['4'] = 188  ;
q['5'] = 284  ;
q['6'] = 272  ;
q['7'] = 238  ;
q['8'] = 269  ;
q['9'] = 299  ;
q['10'] = 86  ;
q['11'] = 216 ;
q['12'] = 145 ;
q['13'] = 140 ;
q['14'] = 299 ;
q['15'] = 344 ;
q['16'] = 198 ;

free variables u(j),z;
u.fx('1')=0;
binary variable x(i,j);

equations
ohr1(i)
ohr2(j)
ohr3(i,j)
ohr4(i)
ohr5(i)
ucel;
ucel..z=e=sum((i,j),d(i,j)*x(i,j));
ohr1(subi(i))..sum(j,x(i,j)$ij4(i,j))=e=1;
ohr2(subj(j))..sum(i,x(i,j)$ij4(i,j))=e=1;
ohr3(i,j)$ij5(i,j)..u(i)-u(j)+q(j)-g*(1-x(i,j))=l=0;
ohr4(subi(i))..q(i)=l=u(i);
ohr5(subi(i))..u(i)=l=g;

option optcr=0;
option optca=0.0;
option iterlim=100000000;
option reslim=100000000;

model vrp /all/;
solve vrp using mip minimizing z;
display x.l,u.l;
```

Zdroj: Vlastné spracovanie na základe: PEKÁR, J. a kol. *Modelovanie rozmiestňovania recyklačných centier.* 2012.