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CSCI 3104 Algorithms

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Assignment #10

**Problem #1:**

If we negate all the edge weights then the Bellman-Ford algorithm will not work because the algorithm requires that the graph does not contain any cycles of negative length, but if it does, the algorithm is able to detect it. Therefore no graphs will yield the longest path by negating edge weights.

**Problem #2:**

a. Output of 1st file

GLPSOL: GLPK LP/MIP Solver, v4.52

Parameter(s) specified in the command line:

--math problem1.ampl

Reading model section from problem1.ampl...

20 lines were read

Generating objVal...

Generating c1...

Generating c2...

Generating c3...

Generating c4...

Generating c5...

Generating c6...

Model has been successfully generated

GLPK Simplex Optimizer, v4.52

7 rows, 3 columns, 13 non-zeros

Preprocessing...

3 rows, 3 columns, 7 non-zeros

Scaling...

A: min|aij| = 1.000e+00 max|aij| = 3.000e+00 ratio = 3.000e+00

Problem data seem to be well scaled

Constructing initial basis...

Size of triangular part is 3

\* 0: obj = 0.000000000e+00 infeas = 0.000e+00 (0)

\* 1: obj = 3.000000000e+01 infeas = 0.000e+00 (0)

LP HAS UNBOUNDED PRIMAL SOLUTION

glp\_simplex: unable to recover undefined or non-optimal solution

Time used: 0.0 secs

Memory used: 0.1 Mb (102314 bytes)

Code:

#declare variables

var x;

var y;

var z;

#declare objective

maximize objVal: 3\*x-2\*y+z;

#constraints

c1: x-y <= 10;

c2: y-z <= 15;

c3: x+2\*y-3\*z <= 35;

c4: x >= 0;

c5: y >= 0;

c6: z >= 0;

#Solve and Show

solve;

display x,y,z,objVal;

end;

(b)

GLPSOL: GLPK LP/MIP Solver, v4.52

Parameter(s) specified in the command line:

--math problem2.ampl

Reading model section from problem2.ampl...

24 lines were read

Generating objVal...

Generating c1...

Generating c2...

Generating c3...

Generating c4...

Generating c5...

Generating c6...

Generating c7...

Generating c8...

Model has been successfully generated

GLPK Simplex Optimizer, v4.52

9 rows, 4 columns, 18 non-zeros

Preprocessing...

3 rows, 4 columns, 9 non-zeros

Scaling...

A: min|aij| = 1.000e+00 max|aij| = 3.000e+00 ratio = 3.000e+00

Problem data seem to be well scaled

Constructing initial basis...

Size of triangular part is 3

\* 0: obj = 0.000000000e+00 infeas = 0.000e+00 (0)

\* 1: obj = -5.500000000e+01 infeas = 0.000e+00 (0)

OPTIMAL LP SOLUTION FOUND

Time used: 0.0 secs

Memory used: 0.1 Mb (102338 bytes)

Display statement at line 23

x.val = 0

y.val = 0

z.val = 0

w.val = 55

objVal.val = -55

Model has been successfully processed

Code:

#declare variables

var x;

var y;

var z;

var w;

#declare objective

minimize objVal: x+y+z-w;

#constraints

c1: x-y+z <= 10;

c2: x-2\*y-z-w <= 15;

c3: x-3\*w <= 35;

c4: w <= 55;

c5: x >= 0;

c6: y >= 0;

c7: z >= 0;

c8: w >= 0;

#Solve and Show

solve;

display x,y,z,w,objVal;

end;

**Problem #3:**

GLPSOL: GLPK LP/MIP Solver, v4.52

Parameter(s) specified in the command line:

--math problem3.ampl

Reading model section from problem3.ampl...

67 lines were read

Generating objVal...

Generating c1...

Generating c2...

Generating c3...

Generating c4...

Generating c5...

Generating c6...

Generating c7...

Generating c8...

Generating c9...

Generating c10...

Generating c11...

Generating c12...

Generating c13...

Generating c14...

Generating c15...

Generating c16...

Generating c17...

Generating c18...

Generating c19...

Generating c20...

Generating c21...

Generating c22...

Generating c23...

Generating c24...

Generating c25...

Generating c26...

Generating c27...

Generating c28...

Generating c29...

Generating c30...

Generating c31...

Generating c32...

Generating c33...

Generating c34...

Generating c35...

Generating c36...

Generating c37...

Generating c38...

Generating c39...

Generating c40...

Generating c41...

Generating c42...

Model has been successfully generated

GLPK Simplex Optimizer, v4.52

43 rows, 13 columns, 85 non-zeros

Preprocessing...

16 rows, 13 columns, 46 non-zeros

Scaling...

A: min|aij| = 1.000e+00 max|aij| = 1.000e+00 ratio = 1.000e+00

Problem data seem to be well scaled

Constructing initial basis...

Size of triangular part is 16

0: obj = 0.000000000e+00 infeas = 1.000e+02 (0)

\* 8: obj = 3.000000000e+03 infeas = 0.000e+00 (0)

\* 10: obj = 1.500000000e+03 infeas = 0.000e+00 (0)

OPTIMAL LP SOLUTION FOUND

Time used: 0.0 secs

Memory used: 0.1 Mb (134966 bytes)

Display statement at line 66

e1.val = 0

e2.val = 0

e3.val = 100

e4.val = 0

e5.val = 0

e6.val = 0

e7.val = 100

e8.val = 0

e9.val = 0

e10.val = 0

e11.val = 0

e12.val = 100

e13.val = 0

objVal.val = 1500

Model has been successfully processed

Code:

#declare variables

var e1;

var e2;

var e3;

var e4;

var e5;

var e6;

var e7;

var e8;

var e9;

var e10;

var e11;

var e12;

var e13;

#declare objective

minimize objVal: 5\*e1+10\*e2+5\*e3+10\*e4+5\*e5+10\*e6+5\*e7+5\*e8+e9+10\*e10+e11+5\*e12+10\*e13;

#constraints

c1: e1 <= 250;

c2: e2 <= 1200;

c3: e3 <= 200;

c4: e4 <= 600;

c5: e5 <= 350;

c6: e6 <= 1000;

c7: e7 <= 600;

c8: e8 <= 400;

c9: e9 <= 160;

c10: e10 <= 1000;

c11: e11 <= 100;

c12: e12 <= 350;

c13: e13 <= 700;

c14: e1 >= 0;

c15: e2 >= 0;

c16: e3 >= 0;

c17: e4 >= 0;

c18: e5 >= 0;

c19: e6 >= 0;

c20: e7 >= 0;

c21: e8 >= 0;

c22: e9 >= 0;

c23: e10 >= 0;

c24: e11 >= 0;

c25: e12 >= 0;

c26: e13 >= 0;

c27: e9+e10+e12 <= 100;

c28: e9+e10+e12 >= 100;

c29: e1 <= e4;

c30: e1 >= e4;

c31: e1+e3 <= e7;

c32: e1+e3 >= e7;

c33: e7 <= e11+e13+e12;

c34: e7 >= e11+e13+e12;

c35: e11+e2 <= e6+e5;

c36: e11+e2 >= e6+e5;

c37: e5 <= e8;

c38: e5 >= e8;

c39: e13+e8 <= e9;

c40: e13+e8 >= e9;

c41: e6 <= e10;

c42: e6 >= e10;

#Solve and Show

solve;

display e1,e2,e3,e4,e5,e6,e7,e8,e9,e10,e11,e12,e13,objVal;

end;