

Name: Qiyao Zhou

Zid: z5379852

1.1

center vertex: vertex(d)

edges included in the spanning spider:

edge (a, d).

edge (b, d).

edge (c, d).

edge (d, e).

edge (e, x).

edge (x, z).

edge (y, z).

1.2

edge (X, Y): -edge (Y, X).

degree (X, Y): - vertex(X), Y= #count {Z: edge (X, Z)}.

center\_acc(X): -A=#max {N: degree (M, N)}, A>=3, degree (X, Y), Y>=3.

center\_acc(X): -A=#max {N: degree (M, N)}, A<3, vertex(X).

1 {center(X): center\_acc(X)} 1.

1.3

leg (X, Y): - edge (X, Y), center(X).

leg (X, Y): - leg (Z, X), edge (X, Y).

1.4

reachable(X): -center(X).

reachable(X): -leg (Y, X).

: - vertex(X), not reachable(X).

1.5

degree\_leg (X, Y): - vertex(X), Y= #count {Z: leg\_guess (X, Z)}.

: - vertex(X), degree\_leg(X, Y), Y>2, not center(X).

1.6

See file spider.lp.

Use command like: clingo --models 0 sample.lp spider.lp

```

z5379852@vx06:~/Desktop/ZQY/4418$ clingo --models 0 sample.lp spider.lp
clingo version 5.4.1
Reading from sample.lp ...
Solving...
Answer: 1
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(e,x)
Answer: 2
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(e,x) leg(y,z)
Answer: 3
center(d) leg(a,d) leg(a,x) leg(b,d) leg(c,d) leg(c,z) leg(e,x) leg(y,z)
Answer: 4
center(d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(e,x) leg(y,z)
Answer: 5
center(d) leg(a,x) leg(b,d) leg(c,d) leg(c,z) leg(d,e) leg(e,x) leg(y,z)
Answer: 6
center(d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(e,x)
Answer: 7
center(d) leg(a,d) leg(b,d) leg(c,d) leg(c,z) leg(d,e) leg(e,x) leg(y,z)
Answer: 8
center(d) leg(a,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(e,x) leg(y,z)
Answer: 9
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(e,x)
Answer: 10
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,z) leg(d,e) leg(e,x) leg(y,z)
Answer: 11
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(e,x) leg(y,z)
Answer: 12
center(d) leg(a,d) leg(a,x) leg(b,d) leg(c,d) leg(c,z) leg(d,e) leg(y,z)
Answer: 13
center(d) leg(a,d) leg(a,x) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(y,z)
Answer: 14
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,z) leg(d,e) leg(y,z)
Answer: 15
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(y,z)
Answer: 16
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e)
Answer: 17
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(e,x) leg(x,z)
Answer: 18
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(x,z)
Answer: 19
center(d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(x,z)
Answer: 20
center(x) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(e,x) leg(x,z)
Answer: 21
center(d) leg(a,d) leg(b,d) leg(c,d) leg(d,e) leg(e,x) leg(x,z) leg(y,z)
Answer: 22
center(d) leg(a,d) leg(a,x) leg(b,d) leg(c,d) leg(d,e) leg(x,z) leg(y,z)
Answer: 23
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(x,z) leg(y,z)
Answer: 24
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(e,x) leg(x,z)
Answer: 25
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(x,z)
Answer: 26
center(d) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(d,e) leg(x,z) leg(y,z)
Answer: 27
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(e,x) leg(x,z) leg(y,z)
Answer: 28
center(x) leg(a,x) leg(b,d) leg(b,y) leg(c,d) leg(e,x) leg(x,z) leg(y,z)
Answer: 29
center(x) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,z) leg(e,x) leg(x,z)
Answer: 30
center(x) leg(a,x) leg(b,d) leg(b,y) leg(c,z) leg(d,e) leg(e,x) leg(x,z)
Answer: 31
center(z) leg(a,d) leg(b,d) leg(b,y) leg(c,z) leg(e,x) leg(x,z) leg(y,z)
Answer: 32
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,z) leg(d,e) leg(e,x) leg(x,z)
Answer: 33
center(d) leg(a,d) leg(a,x) leg(b,d) leg(b,y) leg(c,z) leg(d,e) leg(x,z)
Answer: 34
center(z) leg(a,x) leg(b,d) leg(b,y) leg(c,z) leg(d,e) leg(x,z) leg(y,z)
Answer: 35
center(z) leg(a,x) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(x,z) leg(y,z)
Answer: 36
center(z) leg(a,d) leg(a,x) leg(b,y) leg(c,z) leg(d,e) leg(x,z) leg(y,z)
Answer: 37
center(d) leg(a,d) leg(a,x) leg(b,y) leg(c,d) leg(d,e) leg(x,z) leg(y,z)
Answer: 38
center(z) leg(a,d) leg(b,y) leg(c,z) leg(d,e) leg(e,x) leg(x,z) leg(y,z)
Answer: 39
center(z) leg(a,d) leg(b,y) leg(c,d) leg(c,z) leg(e,x) leg(x,z) leg(y,z)
Answer: 40
center(x) leg(a,x) leg(b,y) leg(c,d) leg(d,e) leg(e,x) leg(x,z) leg(y,z)
Answer: 41
center(d) leg(a,d) leg(b,y) leg(c,d) leg(d,e) leg(e,x) leg(x,z) leg(y,z)
Answer: 42
center(x) leg(a,d) leg(a,x) leg(b,y) leg(c,d) leg(e,x) leg(x,z) leg(y,z)
SATISFIABLE
Models      : 42
Calls       : 1
Time        : 0.004s (Solving: 0.00s 1st Model: 0.00s Unsat: 0.00s)
CPU Time    : 0.004s

```

It can be seen that there are 42 distinct spanning spiders in Figure 1.

1.7

See file spidershortlegs.lp

Use command like :clingo --models 0 sample.lp spidershortlegs.lp

```

z5379852@vx06:~/Desktop/ZQY/4418$ clingo --models 0 sample.lp spidershortlegs.lp
clingo version 5.4.1
Reading from sample.lp ...
spidershortlegs.lp:59:11-12: info: tuple ignored:
    #inf@0

Solving...
Answer: 1
center(d) leg(a,d) leg(b,d) leg(b,y) leg(c,d) leg(c,z) leg(d,e) leg(e,x)
Optimization: 2
OPTIMUM FOUND

```

Here is the result of sample.