



Homework 11

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From: Harbin Institute of Technology

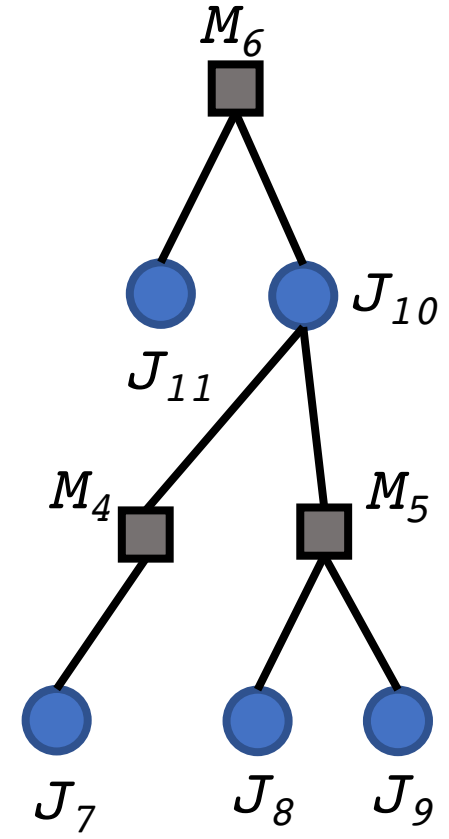
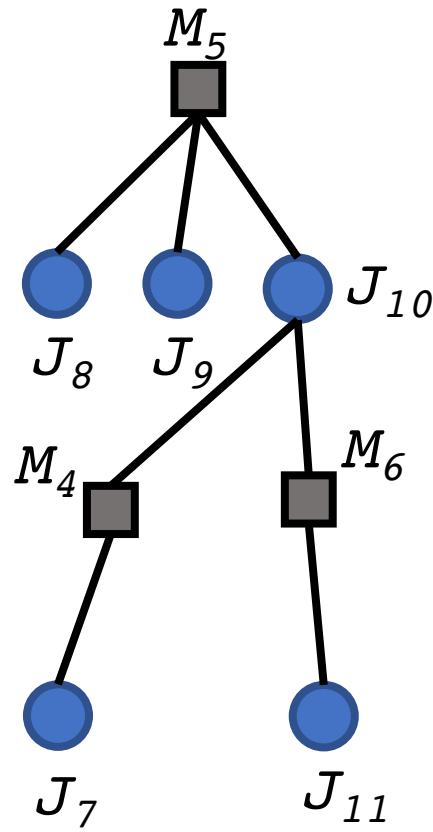
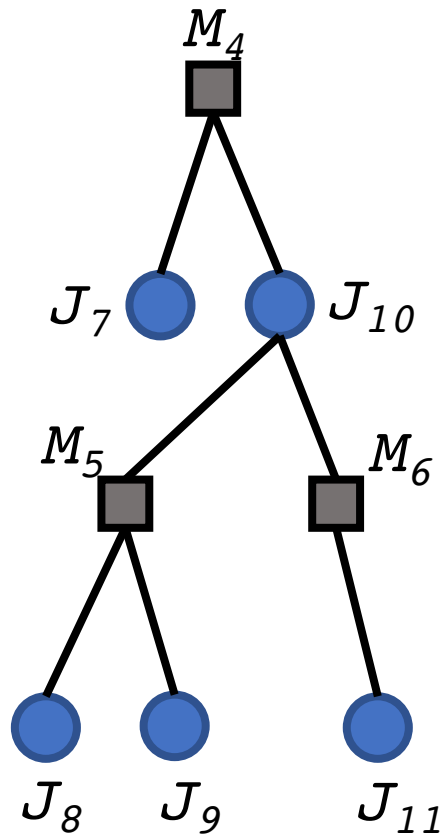
2020.12.03



Exercise 9-1



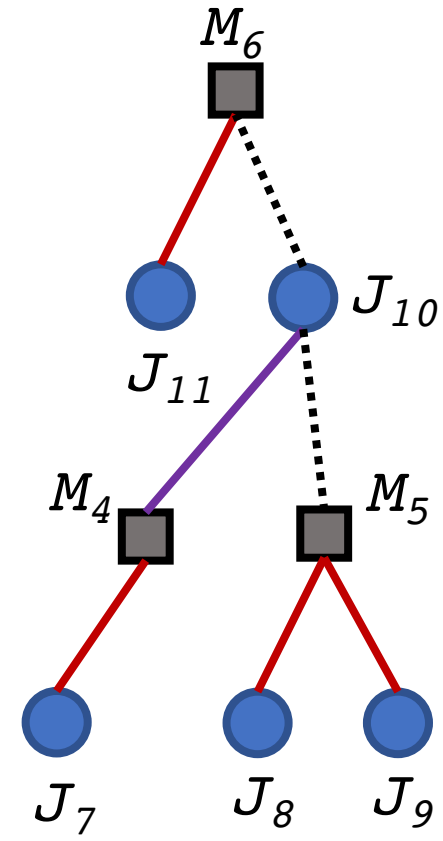
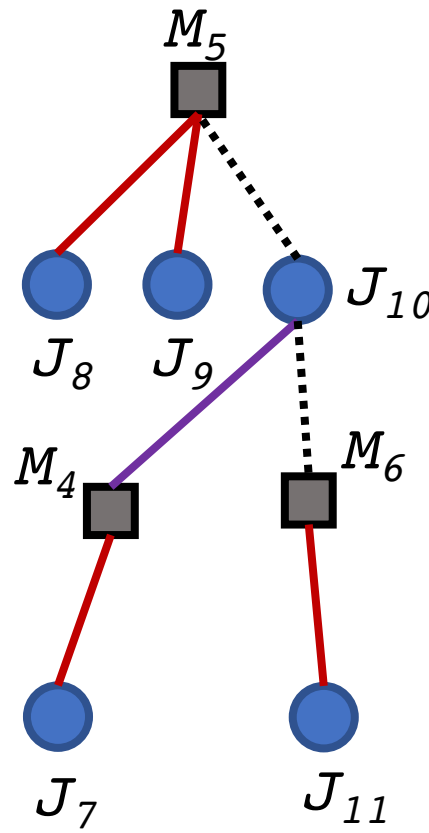
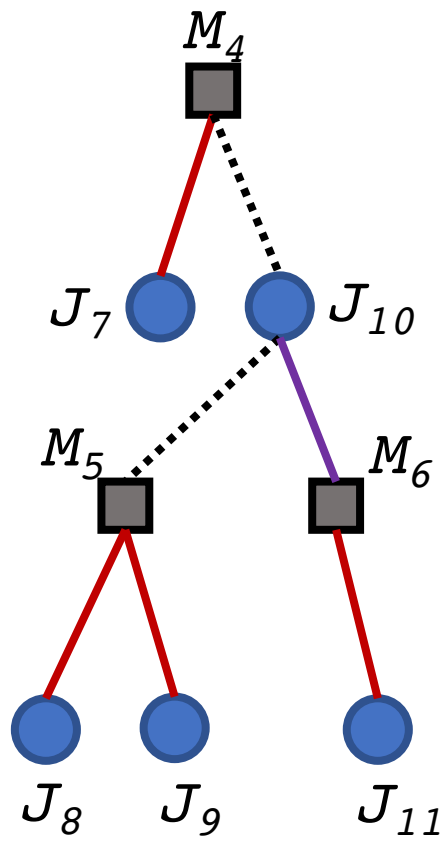
■ Generate all possible tree structures





Exercise 9-1

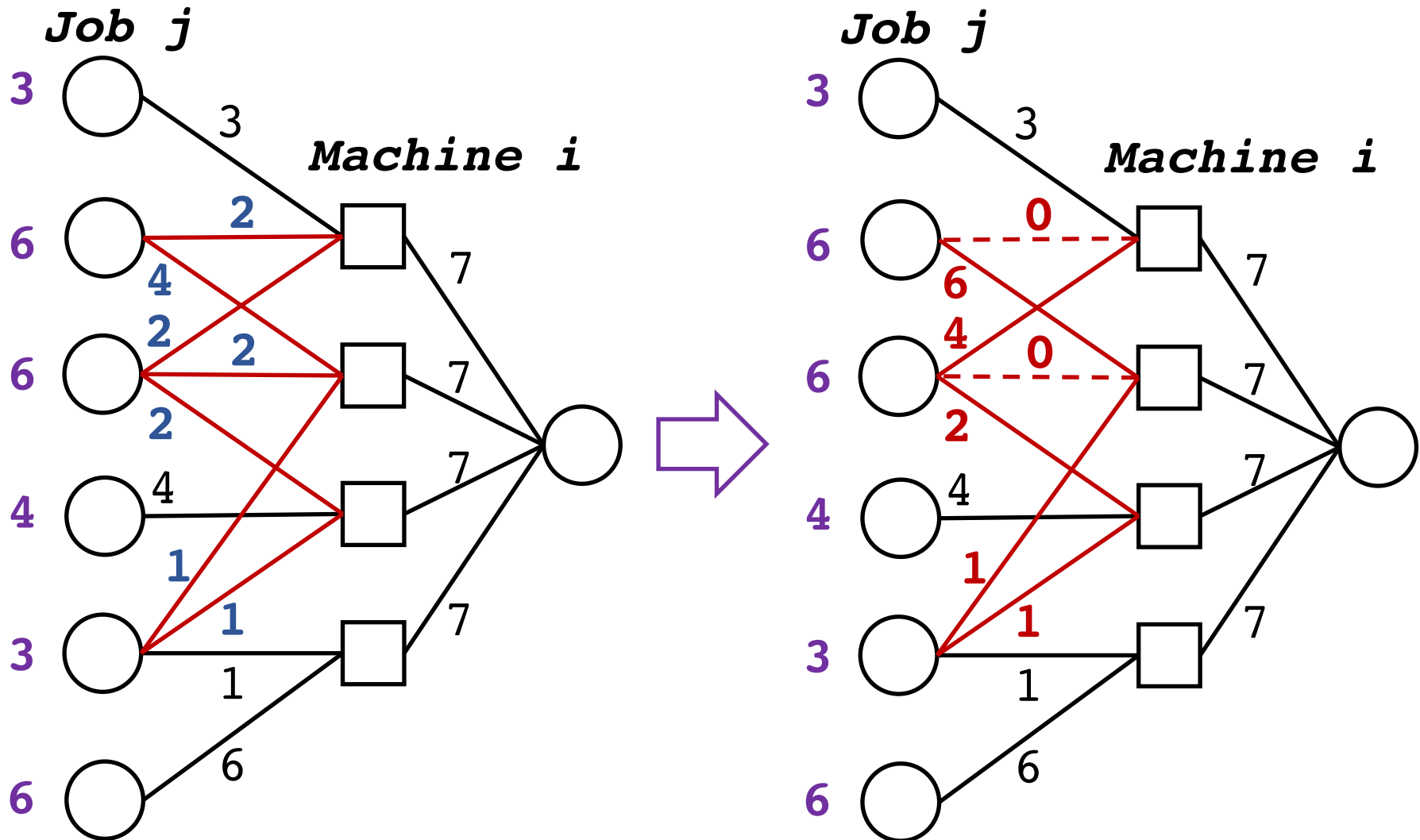
- Discuss the choice of a tree structure and the choice of a child machine node for each intermediate job node.





Exercise 9-2

- Generate a graph with no cycle from the following graph with cycles

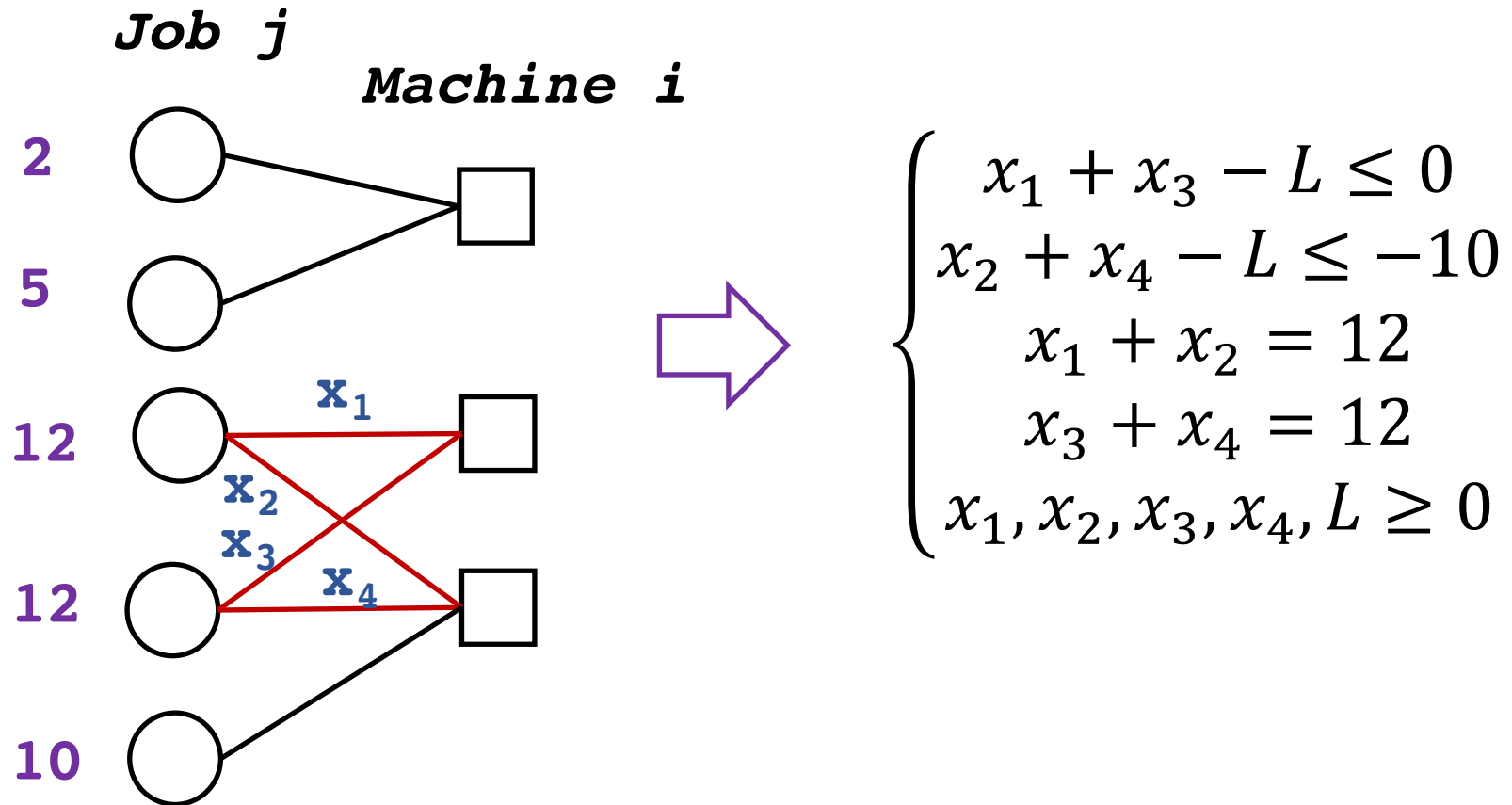




Exercise 9-3



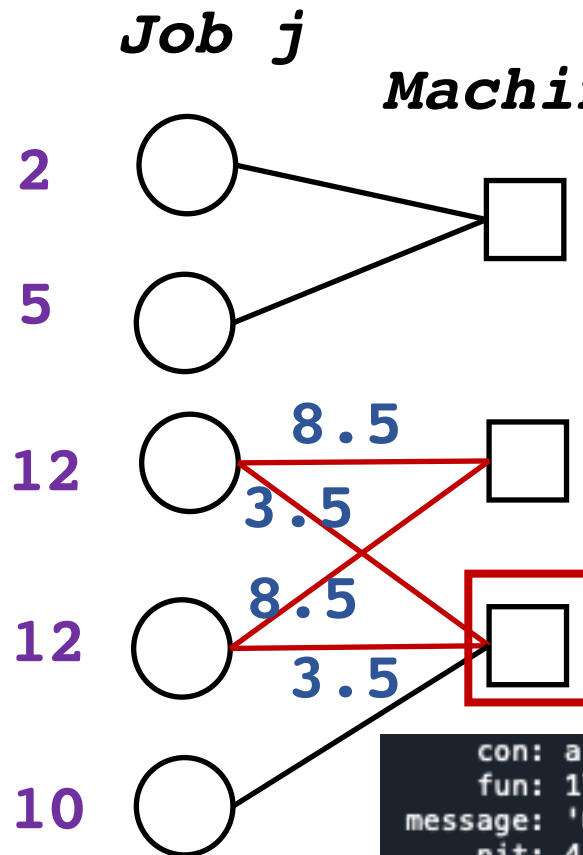
- Create one example of the generalized LB problem where a graph with cycle is obtained from it.





Exercise 9-3

- Create one example of the generalized LB problem where a graph with cycle is obtained from it.



```
import numpy
from scipy import optimize

c = numpy.array([0,0,0,0,1])

A_ub = numpy.array([[1,0,1,0,-1],[0,1,0,1,-1]])
b_ub = numpy.array([0,-10])
A_eb = numpy.array([[1,1,0,0,0],[0,0,1,1,0]])
b_eb = numpy.array([12,12])
all_bounds = (0,None)
res = optimize.linprog(c,A_ub,b_ub,A_eb,b_eb,
    bounds=(all_bounds,all_bounds,all_bounds,all_bounds,all_bounds))
print(res)
print("Optimal result is",res.fun)
print("x=[%f,%f,%f,%f,%f]" % (res.x[0],res.x[1],res.x[2],res.x[3],res.x[4]))
```

```
con: array([3.86134468e-07, 3.86134470e-07])
fun: 17.00000012450653
message: 'Optimization terminated successfully.'
nit: 4
slack: array([3.59906069e-07, 6.61375932e-07])
status: 0
success: True
x: array([ 8.49999998,  3.49999997,  8.49999998,  3.49999997, 17.00000012])

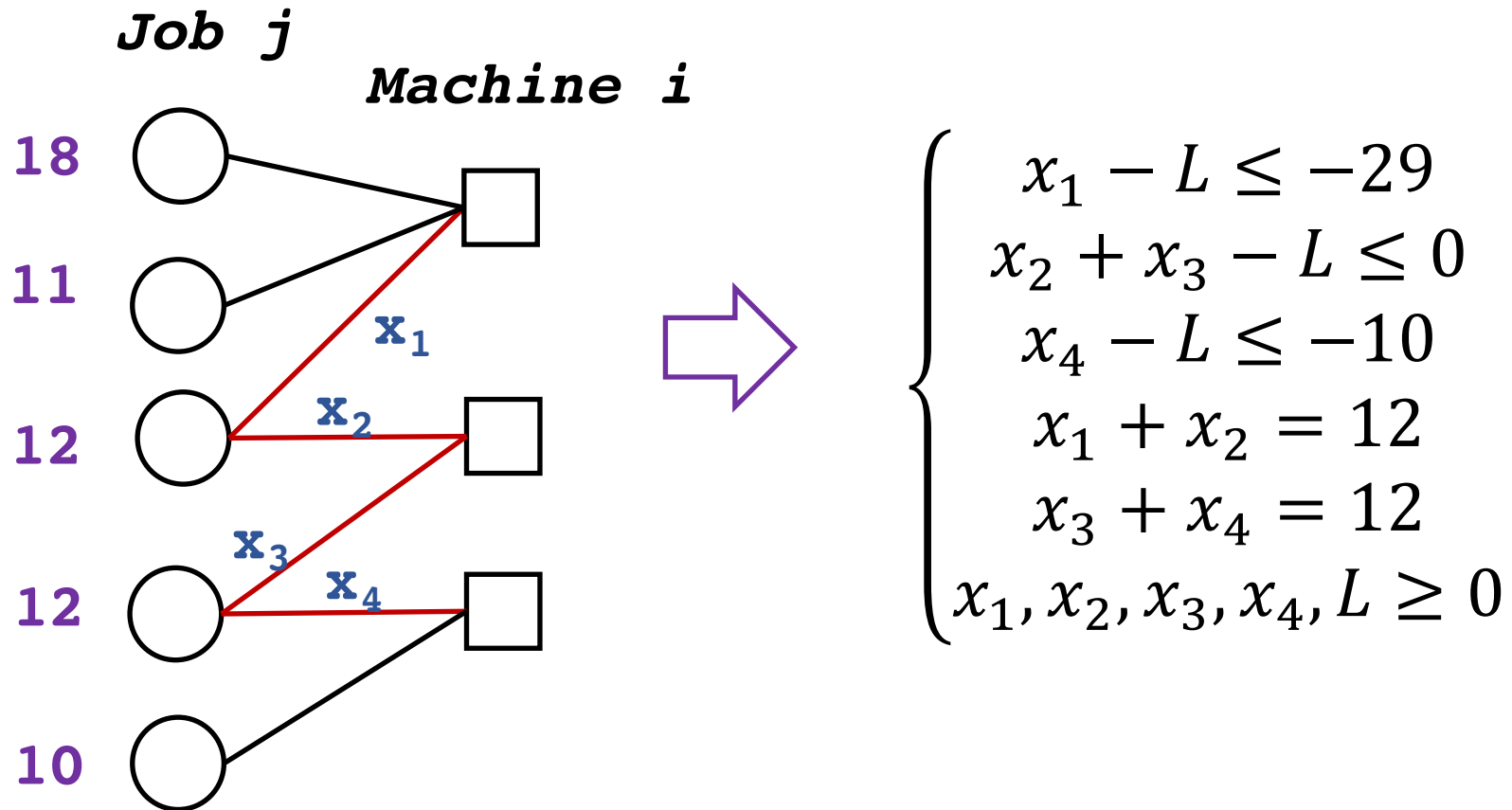
Optimal result is 17.00000012450653
x=[8.500000,3.500000,8.500000,3.500000,17.000000]
```

L=17



Exercise 9-3

- Create one example of the generalized LB problem where a graph with no cycle is obtained from it.



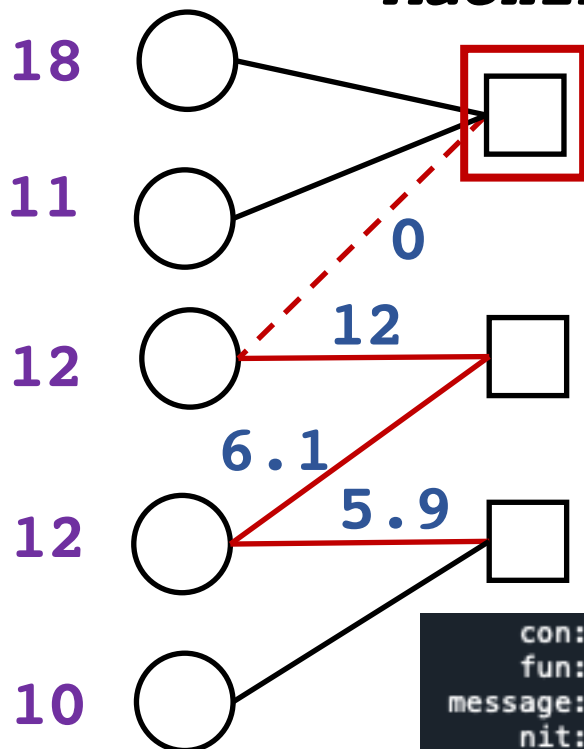


Exercise 9-3

- Create one example of the generalized LB problem where a graph with no cycle is obtained from it.

Job j

Machine i



```
import numpy
from scipy import optimize

c = numpy.array([0,0,0,0,1])

A_ub = numpy.array([[1,0,0,0,-1],[0,1,1,0,-1],[0,0,0,1,-1]])
b_ub = numpy.array([-29,0,-10])
A_lb = numpy.array([[1,1,0,0,0],[0,0,1,1,0]])
b_lb = numpy.array([12,12])
all_bounds = (0,None)
res = optimize.linprog(c,A_ub,b_ub,A_lb,b_lb,
    bounds=(all_bounds,all_bounds,all_bounds,all_bounds,all_bounds))
print(res)
print("Optimal result is",res.fun)
print("x=[%f,%f,%f,%f,%f]" % (res.x[0],res.x[1],res.x[2],res.x[3],res.x[4]))
```

```
con: array([1.56580171e-09, 1.56580526e-09])
fun: 28.999999997493767
message: 'Optimization terminated successfully.'
nit: 5
slack: array([-2.92094171e-09, 1.08685038e+01, 1.31314962e+01])
status: 0
success: True
x: array([4.14706791e-10, 1.20000000e+01, 6.13149623e+00, 5.86850376e+00,
2.00000000e+01])
Optimal result is 28.999999997493767
x=[0.000000,12.000000,6.131496,5.868504,29.000000]
```

L=29



Thanks!

**Please contact me with email
if you have any problem**

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