Problems 43

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Question 43

Problem

The following table shows the information on the availability of supply to each warehouse, the requirement of each market and unit of transportation cost (in rupees) from each warehouse to each market.

		Market				
		M_1	M_2	M_3	M_4	Supply
	W_1	6	3	5	4	22
Warehouse	W_2	5	9	2	7	15
	W_3	5	7	8	6	8
Requirement		7	12	17	9	

The present transportation schedule is as follows:
W_1 to M_2: 12 units; W_1 to M_3: 1 unit; W_1 to M_4: 9 units; W_2 to M_3: 15 units; W_3 to M_1: 7 units and W_3 to M_3: 1 unit. Then the minimum total transportation cost (in rupees) using MODI method is

Solution

Problem

Find the optimal solution for the given transportation problem

S/D	*1*	*2*	*3*	*4*	*SUPPLY*
1	*6*	*3*	*5*	*4*	*22*
2	*5*	*9*	*2*	*7*	*15*
3	*5*	*7*	*8*	*6*	*8*
DEMAND	*7*	*12*	*17*	*9*	

Table: *12*

Solution

Make the objective function for given costs

$f =$

$$6x_{11}+3x_{12}+5x_{13}+4x_{14}+5x_{21}+9x_{22}+2x_{23}+7x_{24}+5x_{31}+7x_{32}+8x_{33}+6x_{34}$$

Solution

Make the constraints

$$6x_{11} + 3x_{12} + 5x_{13} + 4x_{14} \leq 22$$
$$5x_{21} + 9x_{22} + 2x_{23} + 7x_{24} \leq 15$$
$$5x_{31} + 7x_{32} + 8x_{33} + 6x_{34} \leq 8$$
$$-6x_{11} - 5x_{21} - 5x_{31} \leq -7$$
$$-3x_{12} - 9x_{22} - 7x_{32} \leq -12$$
$$-5x_{13} - 2x_{23} - 8x_{33} \leq -17$$
$$-4x_{14} - 7x_{24} - 6x_{34} \leq -9$$
$$x_{11}, x_{12}, x_{13}, x_{14}, x_{21}, x_{22}, x_{23}, x_{24}, x_{31}, x_{32}, x_{33}, x_{34} \geq 0$$

Solution

```
from cvxopt import matrix from cvxopt import solvers
A = matrix([[1.0 ,1.0 ,1.0 ,1.0 ,0.0 ,0.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0
,0.0 ,0.0 ,0.0 ,1.0 ,1.0 , 1.0 ,1.0 ,0.0 ,0.0 ,0.0 ,0.0 ] , [0.0 ,0.0 ,0.0 ,0.0 ,0.0
,0.0 , 0.0 ,0.0 ,1.0 ,1.0 ,1.0 ,1.0] , [ - 1.0 ,0.0 ,0.0 ,0.0 , - 1.0 ,0.0 , 0.0 ,0.0
, - 1.0 ,0.0 ,0.0 ,0.0] , [0.0 , - 1.0 ,0.0 ,0.0 ,0.0 , - 1.0 , 0.0 ,0.0 ,0.0 , - 1.0
,0.0 ,0.0] , [0.0 ,0.0 , - 1.0 ,0.0 ,0.0 ,0.0 , - 1.0 ,0.0 ,0.0 ,0.0 , - 1.0 ,0.0] ,
[0.0 ,0.0 ,0.0 , - 1.0 ,0.0 ,0.0 , 0.0 , - 1.0 ,0.0 ,0.0 ,0.0 , - 1.0] , [ - 1.0 ,0.0
,0.0 ,0.0 ,0.0 ,0.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0 , - 1.0 ,0.0 ,0.0 ,0.0
,0.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0 ,0.0 , - 1.0 ,0.0 ,0.0 ,0.0 , 0.0 ,0.0
,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0 ,0.0 ,0.0 , - 1.0 ,0.0 ,0.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0
,0.0] , [0.0 ,0.0 ,0.0 ,0.0 , - 1.0 ,0.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0 ,0.0
,0.0 ,0.0 ,0.0 , - 1.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0 ,0.0 ,0.0 ,0.0 ,0.0
,0.0 , - 1.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0] , [0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0 , 0.0 , - 1.0
,0.0 ,0.0 ,0.0 ,0.0] , [0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0 , 0.0 ,0.0 , - 1.0 ,0.0 ,0.0
,0.0] , [0.0 ,0.0 ,0.0 ,0.0 ,0.0 ,0.0 , 0.0 ,0.0 ,0.0 , - 1.0 ,0.0 ,0.0] , [0.0 ,0.0
,0.0 ,0.0 ,0.0 ,0.0 , 0.0 ,0.0 ,0.0 ,0.0 , - 1.0 ,0.0] , [0.0 ,0.0 ,0.0 ,0.0 ,0.0
,0.0 , 0.0 ,0.0 ,0.0 ,0.0 ,0.0 , - 1.0]])
```

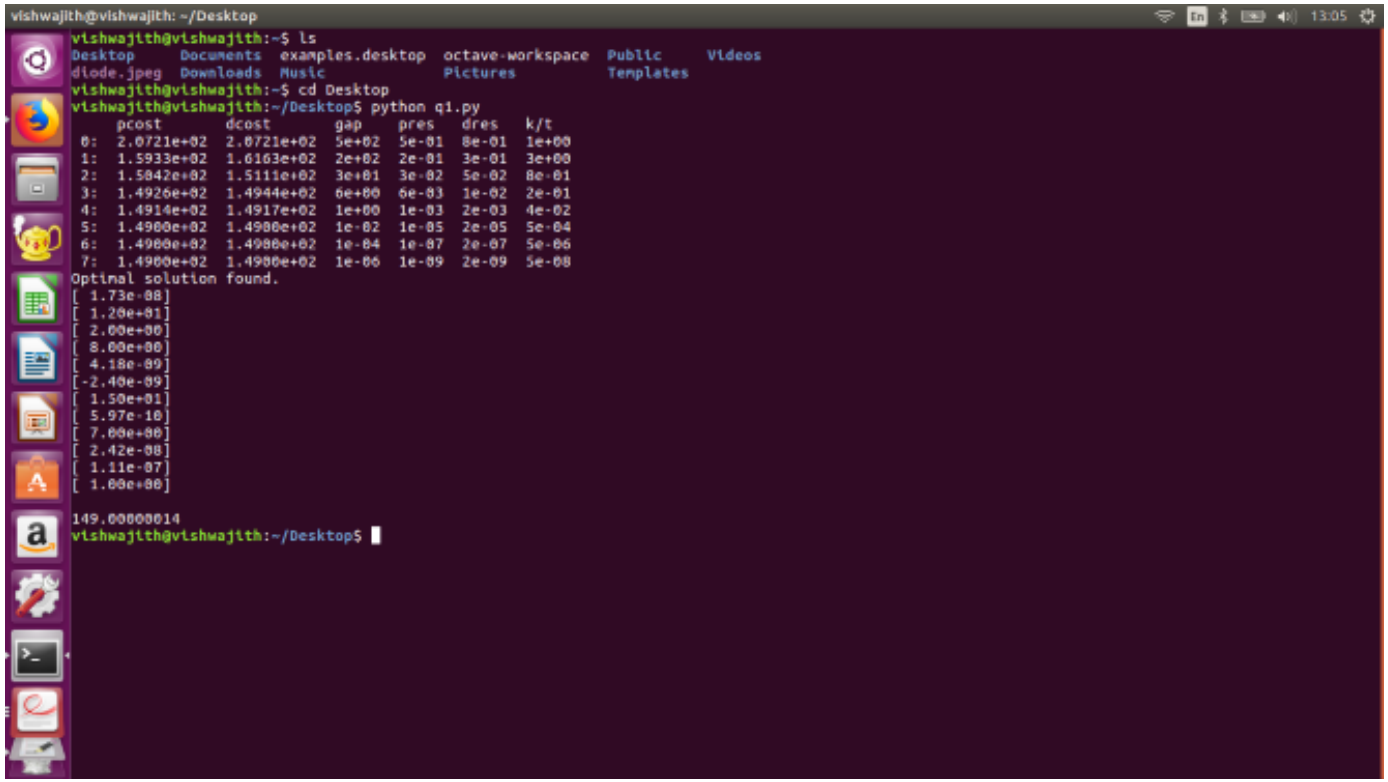
Solution

```
b = matrix ([22.0 , 15.0 , 8.0 , - 7.0 , - 12.0 , - 17.0 , - 9.0 , 0 ,0 ,0 ,0 ,0
,0 ,0 ,0 ,0 ,0 ,0])
c= matrix ( [ 6.0 ,3.0 ,5.0 ,4.0 , 5.0 , 9.0 , 2.0 , 7.0 , 5.0 , 7.0 ,8.0 , 6.0])
sol = solvers.sdp ( c , A.T , b )
print ( sol ['x'] )
print(sol['x'][0]*6.0 + sol['x'][1]*3.0 + sol['x'][2]*5.0 + sol['x'][3]*4.0 +
sol['x'][4]*5.0 + sol['x'][5]*9.0 + sol['x'][6]*2.0 +sol['x'][7]*7.0
+sol['x'][8]*5.0 + sol['x'][9]*7.0 + sol['x'][10]*8.0 + sol['x'][11]*6.0)
```

Solution

Figure: minimal total transportation cost is

Solution


vishwajith@vishwajith: ~/Desktop
vishwajith@vishwajith:~$ ls
Desktop Documents examples.desktop octave-workspace Public Videos
diode.jpeg Downloads Music Pictures Templates
vishwajith@vishwajith:~$ cd Desktop
vishwajith@vishwajith:~/Desktop$ python q1.py
pcost dcost gap pres dres k/t
0: 2.0721e+02 2.0721e+02 5e+02 5e-01 8e-01 1e+00
1: 1.5933e+02 1.6163e+02 2e+02 2e-01 3e-01 3e+00
2: 1.5842e+02 1.5111e+02 3e+01 3e-02 5e-02 8e-01
3: 1.4926e+02 1.4944e+02 6e+00 6e-03 1e-02 2e-01
4: 1.4914e+02 1.4917e+02 1e+00 1e-03 2e-03 4e-02
5: 1.4900e+02 1.4900e+02 1e-02 1e-05 2e-05 5e-04
6: 1.4900e+02 1.4900e+02 1e-04 1e-07 2e-07 5e-06
7: 1.4900e+02 1.4900e+02 1e-06 1e-09 2e-09 5e-08
Optimal solution found.
[1.73e-08]
[1.20e+01]
[2.00e+00]
[8.00e+00]
[4.18e-09]
[-2.40e-09]
[1.50e+01]
[5.97e-10]
[7.00e+00]
[2.42e-08]
[1.11e-07]
[1.00e+00]
149.00000014
vishwajith@vishwajith:~/Desktop$

And last

Thank You