1. a). Determine a minimum cost staffing plan for the center. In your solution, how many consultants will be paid to work full time and how many will be paid to work part time? What is the minimum cost ?

Linear Programming Model

Let F1 = number of full time consultants for the morning shift
F2 = number of full time consultants for the afternoon shift
F3 = number of full time consultants for the evening shift

P1 = number of part-time consultants for the first shift
P2 = number of part-time consultants for the second shift
P3 = number of part-time consultants for the third shift
P4 = number of part-time consultants for the fourth shift

Minimum Cost = (8*14)*(F1+F2+F3) + (4*12)*(P1+P2+P3+P4)

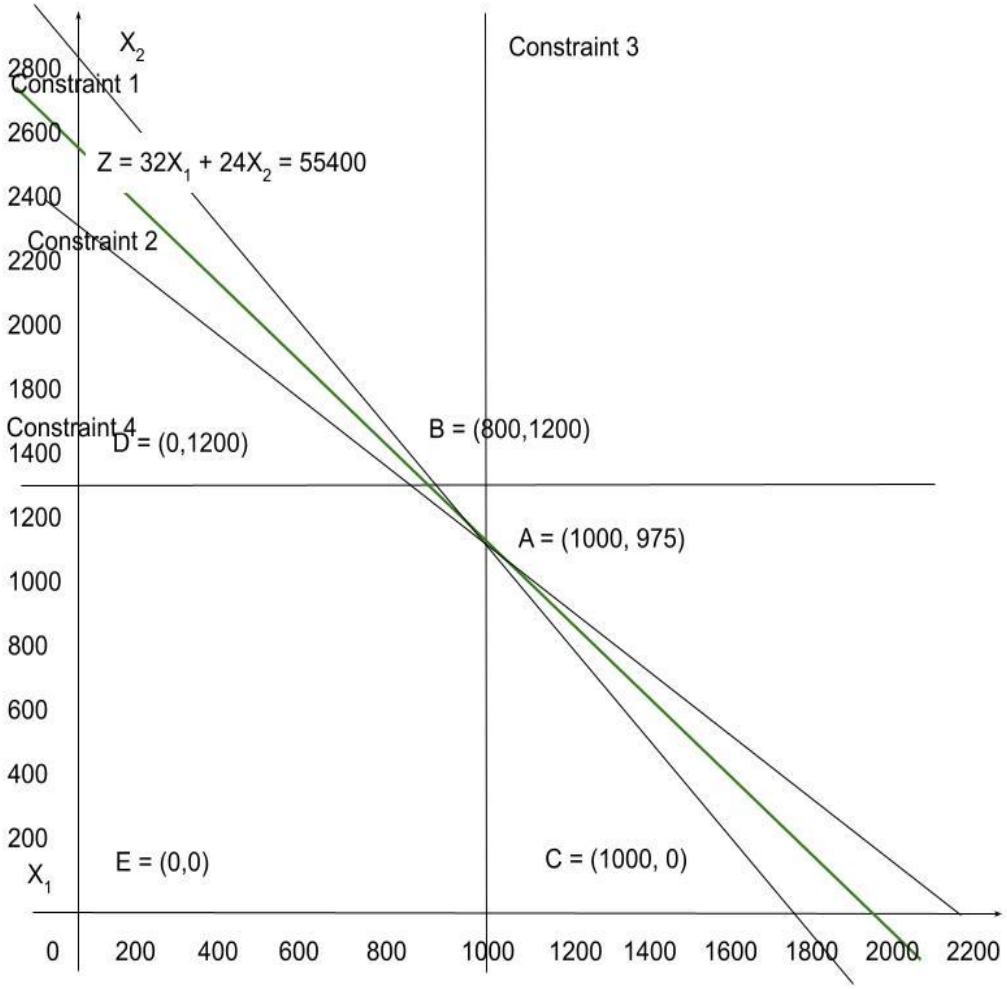
1. b) After thinking about this problem for a while, you have decided to recognize meal breaks explicitly in the scheduling of full -time consultants. In particular, full - time consultants are entitled to a one - hour lunch break during their eight - hour shift. In Addition, employment rules specify that the lunch break can start after three hours of work or after four hours of work, but those are the only alternatives. Part-time consultants do not receive a meal break. Under these conditions, find a minimum-cost staffing plan. What is the minimum cost

S.T

(8AM to 12PM) : P1 + F1 >= 4
(12PM to 4PM) : P2 + F1 + F2 >= 8
(4PM to 8PM) : P3 + F2 + F3 >= 10
(8PM to 12AM) : F3 + P4 >= 6

F1 >= P1
F1 + F2 >= P2
F2 + F3 >= P3
F4 >= P4

F1, F2, F3, P1, P2, P3,P4 >= 0



3. a. Define the decision variables
b. Formulate a linear programming model for this problem.
c. Solve the problem using lpsolve, or any other equivalent library in R.

a).
Decision Variables:

SPL1 = Number of large size units produced in the plant 1
SPM1 = Number of medium size units produced in the plant 1
SPS1 = Number of small size units produced in the plant 1
SPL2 = Number of large size units produced in the plant 2
SPM2 = Number of medium size units produced in the plant 2
SPS2 = Number of small size units produced in the plant 2
SPL3 = Number of large size units produced in the plant 3

SPM3 = Number of medium size units produced in the plant 3
SPS3 = Number of small size units produced in the plant 3

b).
Maximizing the profit::

Z = 420 (SPL1 + SPL2 + SPL3) + 360 (SPM1 + SPM2 +SPM3) + 300 (SPS1 + SPS2 + SPS3)

= 420SPL1 + 420SPL2 + 420SPL3 + 360SPM1 + 360SPM2 + 360SPM3 + 300SPS1 + 300SPS2 + 300SPS3

Storage:

20SPL1 + 15SPM1 + 12 SPS1 <= 13000 ;

20SPL2 + 15SPM2 + 12SPS2 <= 12000 ;

20SPL3 + 15SPM3 + 12SPS3 <= 5000 ;

Excess Capacity:

SPL1 + SPM1 + SPS1 <=750 ;

SPL2 + SPM2 + SPS2 <= 900 ;

SPL3 + SPM3 + SPS3 <= 450 ;

Sales:

SPL1 + SPL2 + SPL3 <= 900 ;

SPM1 + SPM2 + SPM3 <= 1200 ;

SPS1 + SPS2 + SPS3 <= 750;

1/ 750(SPL1 + SPM1 + SPS1) - 1/900(SPL2 + SPM2 + SPS2) = 0

1/750(SPL1 + SPM1 + SPS1) - 1/450(SPL3 + SPM3 + SPS3) = 0

SPL1, SPM1, SPS1, SPL2, SPM2, SPS2, SPL3, SPM3, SPS3 >= 0