Module 4

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##Module 4 with R

# install.packages("lpSolve")  
library(lpSolve)

## Warning: package 'lpSolve' was built under R version 4.4.2

# Objective coefficients (profits for x1..x9)  
obj <- c(420, 420, 420, # x1,x2,x3 (Large)  
 360, 360, 360, # x4,x5,x6 (Medium)  
 300, 300, 300) # x7,x8,x9 (Small)  
  
# Constraints matrix  
A <- matrix(0, nrow=11, ncol=9)  
  
# 1) Plant capacities  
A[1, c(1,4,7)] <- 1 # x1+x4+x7 ≤ 750  
A[2, c(2,5,8)] <- 1 # x2+x5+x8 ≤ 900  
A[3, c(3,6,9)] <- 1 # x3+x6+x9 ≤ 450  
  
# 2) Storage  
A[4, c(1,4,7)] <- c(20,15,12) # Plant 1 ≤ 13000  
A[5, c(2,5,8)] <- c(20,15,12) # Plant 2 ≤ 12000  
A[6, c(3,6,9)] <- c(20,15,12) # Plant 3 ≤ 5000  
  
# 3) Market demand  
A[7, c(1,2,3)] <- 1 # Large ≤ 900  
A[8, c(4,5,6)] <- 1 # Medium ≤ 1200  
A[9, c(7,8,9)] <- 1 # Small ≤ 750  
  
# 4) Equal capacity usage (cross-multiplied equations)  
A[10, c(1,4,7)] <- 900  
A[10, c(2,5,8)] <- -750  
  
A[11, c(1,4,7)] <- 450  
A[11, c(3,6,9)] <- -750  
  
# Directions  
dir <- c("<=", "<=", "<=",  
 "<=", "<=", "<=",  
 "<=", "<=", "<=",  
 "=", "=")  
  
# RHS values  
rhs <- c(750, 900, 450,  
 13000, 12000, 5000,  
 900, 1200, 750,  
 0, 0)  
  
# Solve LP  
solution <- lp("max", obj, A, dir, rhs)  
  
# Output  
print(solution$status) # 0 = optimal

## [1] 0

print(solution$objval) # max profit

## [1] 696000

print(solution$solution) # values of x1..x9

## [1] 516.6667 0.0000 0.0000 177.7778 666.6667 0.0000 0.0000 166.6667  
## [9] 416.6667