Quantitative Management Assignment-3 Dual Solution

1. Importing Library

```
# Importing "lpSolveAPI" library
library(lpSolveAPI)
```

2. Assigning Constraints and decision Variables

```
# 1.Assigning number of constraints and decision variables
lprec_dual <- make.lp(0, 11)
```

3. Setting up Objective function ,Constraints , decision variables

```
# 3.1 Objective Function

set.objfn(lprec_dual, c(750,900,450,13000,12000,5000,900,1200,750,0,0))

# 3.2 Providing values for each constraint

add.constraint(lprec_dual, c(1, 20, 1,900,450), ">=", 420,indices =c(1,4,7,10,11) )
add.constraint(lprec_dual, c(1, 15, 1,900,450), ">=", 360 , indices =c(1,4,8,10,11) )
add.constraint(lprec_dual, c(1, 12, 1,900,450), ">=", 300,indices=c(1,4,9,10,11))
add.constraint(lprec_dual, c(1, 20,1,-750), ">=", 420,indices =c(2,5,7,10) )
add.constraint(lprec_dual, c(1, 15, 1,-750), ">=", 360,indices = c(2,5,8,10))
add.constraint(lprec_dual, c(1, 12, 1,-750), ">=", 300 , indices = c(2,5,9,10))
add.constraint(lprec_dual, c(1, 20, 1,-750), ">=", 420, indices=c(3,6,7,11))
add.constraint(lprec_dual, c(1, 15, 1,-750), ">=", 360,indices = c(3,6,8,11))
add.constraint(lprec_dual, c(1, 12, 1,-750), ">=", 300, indices = c(3,6,9,11))

# Applying lower bounds on last 2 columns(v10,v11)
# Note that the default boundaries on the decision variable are c(0, 0, 0) and c(Inf, Inf, Inf).Since,

set.bounds(lprec_dual,lower=c(-Inf,-Inf),columns = c(10,11))
```

```
# 3.3 Naming the decision variables (column) and constraints (rows)

rownames_dual <- c("Plant1_Large", "Plant1_Medium", "Plant1_Small", "Plant2_Large", "Plant2_Medium", "Pl

colnames_dual <- c("v1", "v2", "v3","v4", "v5", "v6","v7", "v8", "v9","v10","v11")

dimnames(lprec_dual) <- list(rownames_dual,colnames_dual)
```

4. View the linear program external pointer

```
lprec_dual
```

```
## Model name:
##   a linear program with 11 decision variables and 9 constraints
```

5. Save the LP model into a file

```
write.lp(lprec_dual, filename = "Dual_Solution_Assignment_3.lp", type = "lp")
```

6. Reading from dual file and solving it

```
weiglet_dual <- read.lp("dual_weiglet_Assignment_3.lp") # create an lp object weiglet

solve(weiglet_dual)                    # Solution
```

```
## [1] 0
```

```
get.objective(weiglet_dual)            # get objective value
```

```
## [1] 696000
```

```
get.variables(weiglet_dual)            # get values of decision variables
```

```
##  [1]  0.00  0.00  0.00 12.00 20.00 60.00  0.00  0.00  0.00 -0.08  0.56
```

```
get.constraints(weiglet_dual)          # get constraints
```

```
## [1] 420 360 324 460 360 300 780 480 300
```

7. Results:

- Used **"lpSolveAPI"** library to solve the LP problem.
- As per the above results:
- The minimum total net profit per day,Z= **696000**.
- The objective function value for the dual problem using **this solution is the same as the objective function value for the primal problem with the corresponding solution**.The dual solution corresponding to the optimal primal solution is both **optimal** and **feasible**.
