QMM- Assignment 6

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```
library(lpSolve)
library(lpSolveAPI)


AP_HUB <- read.lp("C:/Users/gauth/OneDrive/Desktop/AP_HUB.lp")
AP_HUB
```

```
## Model name:
##            x1   x2   x3   x4   x5   x6   x7
## Minimize  775  800  800  800  800  775  750
## R1          0    1    1    1    1    1    0  >=  18
## R2          0    0    1    1    1    1    1  >=  27
## R3          1    0    0    1    1    1    1  >=  22
## R4          1    1    0    0    1    1    1  >=  26
## R5          1    1    1    0    0    1    1  >=  25
## R6          1    1    1    1    0    0    1  >=  21
## R7          1    1    1    1    1    0    0  >=  19
## Kind      Std  Std  Std  Std  Std  Std  Std
## Type      Int  Int  Int  Int  Int  Int  Int
## Upper     Inf  Inf  Inf  Inf  Inf  Inf  Inf
## Lower       0    0    0    0    0    0    0
```

The table below provides an estimate of the number of workers needed each day of the week.

```
DAYS_AND_WORKERS <- matrix(c("Sunday","Monday","Tuesday","Wednesday","Thursday","Friday","Saturday", 18

colnames(DAYS_AND_WORKERS) <- c("Days_Of_The_Week","Workers_Required")
as.table(DAYS_AND_WORKERS)
```

```
##   Days_Of_The_Week Workers_Required
## A Sunday           18
## B Monday           27
## C Tuesday          22
## D Wednesday        26
## E Thursday         25
## F Friday           21
## G Saturday         19
```

Package handlers at AP are guaranteed a five-day work week with two consecutive days off. The base wage for the handlers is $750 per week. Workers working on Saturday or Sunday receive an additional $25 per day. The possible shifts and salaries for package handlers are:

```
Shift_DaysOff_Wage <- matrix(c(1,2,3,4,5,6,7,
                               "Sunday and Monday","Monday and Tuesday","Tuesday and Wednesday","Wednes
                               "$775","$800","$800","$800","$800","$775","$750"), ncol = 3, byrow = F)

colnames(Shift_DaysOff_Wage) <- c("Shift", "Days_Off", "Wage")
as.table(Shift_DaysOff_Wage)
```

```
##   Shift Days_Off               Wage
## A 1     Sunday and Monday      $775
## B 2     Monday and Tuesday     $800
## C 3     Tuesday and Wednesday  $800
## D 4     Wednesday and Thursday $800
## E 5     Thursday and Friday    $800
## F 6     Friday and Saturday    $775
## G 7     Saturday and Sunday    $750
```

```
solve(AP_HUB)
```

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

```
get.objective(AP_HUB)
```

```
## [1] 25675
```

The total cost is $25675.

```
get.variables(AP_HUB)
```

```
## [1]  2  4  5  0  8  1 13
```

From the above, we can derive :- x1 = 2, Which means 2 workers have been assigned to Shift 1. x2 = 4, Which means 4 workers have been assigned to Shift 2. x3 = 5, Which means 5 workers have been assigned to Shift 3. x4 = 0, Which means 0 workers have been assigned to Shift 4. x5 = 8, Which means 8 workers have been assigned to Shift 5. x6 = 1, Which means 1 worker has been assigned to Shift 6. x7 = 13, Which means 13 workers have been assigned to Shift 7.

Hence, the workers availabe for each day is

```
Workers_Available <- matrix(c(0,4,5,0,8,1,0,0,0,5,0,8,1,13,2,0,0,0,8,1,13,2,4,0,0,8,1,13,2,4,5,0,0,1,13
colnames(Workers_Available)<- c("Shift1", "Shift2", "Shift3", "Shift4", "Shift5", "Shift6", "Shift7")
row.names(Workers_Available) <- c('Sunday', 'Monday', 'Tuesday','Wednesda','Thursday','Friday','Saturda
Workers_Available
```

```
##           Shift1 Shift2 Shift3 Shift4 Shift5 Shift6 Shift7
## Sunday         0      4      5      0      8      1      0
## Monday         0      0      5      0      8      1     13
## Tuesday        2      0      0      0      8      1     13
## Wednesda       2      4      0      0      8      1     13
## Thursday       2      4      5      0      0      1     13
## Friday         2      3      4      0      0      0     13
## Saturday       2      4      5      0      8      0      0
```

```
rowSums(Workers_Available)
```

```
##   Sunday   Monday  Tuesday Wednesda Thursday   Friday Saturday
##       18       27       24       28       25       22       19
```