

## 1. Decision Variables:

+)  $X[i,j,k] = 1$  if staff  $i$  work on phase  $k$  of day  $j$ , 0 otherwise

Such that:  $1 \leq i \leq N$ ,  $1 \leq j \leq D$ ,  $1 \leq k \leq 4$

+)  $Y[i,j] = 1$  if staff  $i$  have a day off on day  $j$ , 0 otherwise

## 2. Constraints:

+) Each day, an employee can only work one shift at most:

$$\sum_{1 \leq k \leq 4} X[i,j,k] \leq 1, \text{ với } 1 \leq i \leq N, 1 \leq j \leq D$$

+) If you work the night shift the day before, you can rest the next day:

$$X[i,j,4] + \sum_{1 \leq k' \leq 4} X[i,j,k'] \leq 1, \text{ với } 1 \leq i \leq N, 1 \leq j \leq D$$

+) List of employee leave days  $i$ :

$$F[i] = \sum_{1 \leq j \leq 4} X[i,j,4], \text{ với } 1 \leq i \leq N, 1 \leq j \leq D$$

+) Each shift in each day has at least  $\alpha$  employees and at most  $\beta$  employees:

$$\alpha \leq \sum_{1 \leq i \leq N} X[i,j,k] \leq \beta, \text{ với } 1 \leq j \leq D, 1 \leq k \leq 4$$

## 3. Objective function:

$N$  min with  $N \geq F[i]$