

M parallel machines model ($RM|r|\Sigma C$)

- Variables

C_i = Job i completion time .

$$x_{im} = \begin{cases} 0 & \text{Job } i \text{ is not assigned to } m. \\ 1 & \text{Job } i \text{ is assigned to } m \end{cases}$$

- Assignment constraints:

$$\sum_{m=1}^M x_{im} = 1 \quad \forall i = 1..Jobs$$

$$x_{i1} + x_{i2} = 1 \quad \forall i = 1..Jobs \quad \text{(in the 2 machine case)}$$

M parallel machines model ($RM|r|\Sigma C$)

$$\min \sum_{i=1}^{Jobs} C_i$$

$$C_i \geq (r_i + p_{im})x_{im} \quad \forall i = 1..Jobs; \forall m = 1..M$$

$$\sum_{m=1}^M x_{im} = 1 \quad \forall i = 1..Jobs$$

$$C_i \geq C_j + p_{im} - My_{i,j} - M(1 - x_{im}) - M(1 - x_{jm}) \quad \forall m = 1..M; \forall i, j = 1..Jobs \mid i \neq j$$

$$C_j \geq C_i + p_{jm} - My_{j,i} - M(1 - x_{im}) - M(1 - x_{jm}) \quad \forall m = 1..M; \forall i, j = 1..Jobs \mid i \neq j$$

$$y_{i,j} = 1 - y_{j,i} \quad \forall i, j = 1..Jobs \mid i \neq j$$

$$VARIABLES = C_i \geq 0, x_{im} \in \{0,1\}, y_{i,j} \in \{0,1\}$$