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NP- hard

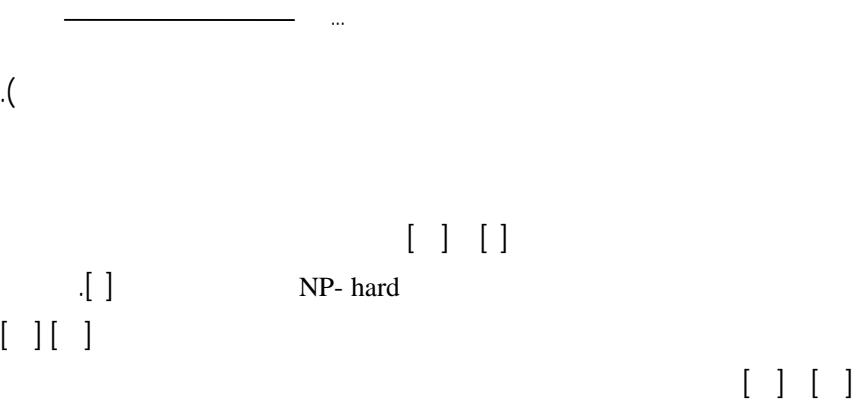
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$$\begin{array}{ccccccc}
 & N_i & & S & & & \\
 i & & R_{ij} & j & & i & C_{ij} & i \\
 & R_{\text{sys}} & & & B & j & & \\
 & j = 1, 2, \dots, N_i & & & x_{ij} & & &
 \end{array}$$

$$j \quad i \quad (i=1, 2, \dots, S)$$

$$\begin{aligned}
Max R_{sys} = & \prod_{i=1}^S (\sum_{j=1}^{N_i} x_{ij} \cdot R_{ij}) \\
s.t. \quad & \sum_{i=1}^S \sum_{j=1}^{N_i} x_{ij} C_{ij} \leq B \\
& \sum_{j=1}^{N_i} x_{ij} = 1 \quad , \forall i = 1, 2, \dots, S \\
& x_{ij} \in \{0, 1\} \quad , \forall i = 1, 2, \dots, S \quad , j = 1, 2, \dots, N_i
\end{aligned}$$

$$R_{sys} \quad (\quad) \quad (\quad)$$

$$R_{sys}$$

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$$\overbrace{\hspace{10cm}}^{\text{.}[\hspace{0.1cm}]}$$

$$\overbrace{\hspace{10cm}}^{j \hspace{1cm} q_o \hspace{1cm} i \hspace{1cm} k \hspace{1cm} [\hspace{0.1cm}]}.$$

$$j = \arg\max_{l \in N_i^k}\left[\tau_{il}(t).\left(\eta_{il}\right)^\beta\right] \quad , \quad j \in N_i^k \quad ()$$

$$j \hspace{1cm} 1\text{-}q_o$$

$$p_{ij}^k(t) = \frac{\tau_{ij}(t).\left(\eta_{ij}\right)^\beta}{\sum\limits_{l \in N_i^k}\tau_{il}.\left(\eta_{il}\right)^\beta} \quad , \quad j \in N_i^k \quad ()$$

$$\eta_{ij} \hspace{0.2cm} t \hspace{1.5cm} (i,j) \hspace{1.5cm} \tau_{ij}(t) \hspace{1.5cm} q_o \\ i \hspace{1.5cm} k \hspace{1.5cm} N_i^k.$$

$$\beta$$

$$j \\ q \hspace{1.5cm} N_i^k$$

$$q \leq q_\circ$$

$$\overbrace{\hspace{10em}}^{\dots} \quad () \qquad j \qquad ()$$

$$[\qquad \qquad \qquad \begin{matrix} j & i \\ [] \end{matrix}$$

$$\tau_{ij}(t) \leftarrow (1 - \rho')\tau_{ij}(t) + \rho' \cdot \tau_o \\ \tau_o \quad (\qquad \qquad \qquad) \qquad \qquad \qquad \rho' \\ (\qquad \qquad \qquad) \tau_o$$

$$(\qquad \qquad) \\ (i,j) \\ [\qquad \qquad \qquad ()$$

$$\tau_{ij}(t+1) \leftarrow (1 - \rho)\tau_{ij}(t) + \rho \Delta \tau(t)$$

$$\overbrace{\qquad\qquad\qquad}^{\Delta\tau(t)}\left(\qquad\qquad\right)^{\rho}$$

$$\cdot \qquad\qquad\qquad \cdot$$

$$\left(\qquad\right)_{\tau_\circ}\qquad\qquad\left(\qquad\right)\left(\qquad\right)_{\tau_\circ}$$

$$\left(\qquad\right)_{\tau_\circ}$$

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$$\eta_{ij} = \frac{R_{ij}}{C_{ij}}$$

$$() \quad () \\ (\qquad \qquad \qquad)$$

$$(\;)$$

$$\Delta\tau(t)$$

$$\Delta\tau(t) = \frac{R_{gb}}{TC_{gb}}$$

$$TC_{gb} \quad R_{gb}$$

$$(\;)\\ \bigg) \\ C_{ij} \quad B \qquad \qquad \qquad (\\ TC_{gb} < B \\ B \qquad \qquad \qquad TC_{gb}$$

$$\Delta\tau(t) \qquad \qquad TC_{gb}$$

$$\begin{array}{ccc}
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(i,j) & \eta_{ij} & \tau_{ij}(0) = \tau_o \\
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\end{array}$$

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$\tau_{\circ} < \Delta\tau(t)$

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