

# Notes about Code for Routing

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## 1 TSP

### 1.1 Miller–Tucker–Zemlin (MTZ) formulation

$$\begin{aligned} & \min \sum_{i=1}^n \sum_{j=1, j \neq i}^n c_{ij} x_{ij} \\ s.t. \quad & \sum_{j=1, j \neq i}^n x_{ij} = 1 \quad i = 1, 2, \dots, n \\ & \sum_{i=1, i \neq j}^n x_{ij} = 1 \quad j = 1, 2, \dots, n \\ & u_j - u_i + n(1 - x_{ij}) \geq 1 \quad 1 \leq i \leq n, 2 \leq j \leq n, i \neq j \\ & x_{ij} \in \{0, 1\} \quad 1 \leq i \neq j \leq n \\ & u_1 = 1 \\ & u_i \in \{1, 2, \dots, n\} \quad i = 2, \dots, n \end{aligned}$$

### 1.2 Dantzig–Fulkerson–Johnson (DFJ) formulation

$$\begin{aligned} & \min \sum_{i=1}^n \sum_{j=1, j \neq i}^n c_{ij} x_{ij} \\ s.t. \quad & \sum_{j=1, j \neq i}^n x_{ij} = 1 \quad i = 1, 2, \dots, n \\ & \sum_{i=1, i \neq j}^n x_{ij} = 1 \quad j = 1, 2, \dots, n \\ & \sum_{i \in S} \sum_{j \in S, j \neq i} x_{ij} \leq |S| - 1 \quad S \subset \{1, 2, \dots, n\}, |S| \geq 2 \\ & x_{ij} \in \{0, 1\} \quad 1 \leq i \neq j \leq n \end{aligned}$$