13.3

$$M(q_1 \dots q_k) = \min \Big\{ M(q_1 - d_1 \dots q_k - d_k) + \text{colcost}(\varphi(q_1, d_1), \dots, \varphi(q_k, d_k)) \;\Big|\; (d_1, \dots, d_k) \in \{0,1\} \times \dots \times \{0,1\},\ (d_1, \dots, d_k) \neq \underline{0},\ q_1 \geq d_1 \dots q_k \geq d_k \Big\}$$

$$\text{mit } \varphi(q_i, d_i) = \begin{cases} s_i[q_i] & d_i = 1 \\ 0 & \text{sonst} \end{cases}$$

mit $k = 3$

$$M(q_1, q_2, q_3) = \min \Big\{ M(q_1 - d_1, q_2 - d_2, q_3 - d_3) + \text{colcost}(\varphi(q_1, d_1), \varphi(q_2, d_2), \varphi(q_3, d_3)) \;\Big|\; (d_1, d_2, d_3) \in \{0,1\} \times \{0,1\} \times \{0,1\},\ (d_1, d_2, d_3) \neq (0,0,0),\ q_1 \geq d_1, q_2 \geq d_2, q_3 \geq d_3 \Big\}$$

$$= \min \Big\{ M(q_1, q_2, q_3 - 1) + \text{colcost}(\varphi(q_1, 0), \varphi(q_2, 0), \varphi(q_3, 1)) \quad q_1 \geq 0,\ q_2 \geq 0,\ q_3 \geq 1,$$

$$M(q_1, q_2 - 1, q_3) + \text{colcost}(\varphi(q_1, 0), \varphi(q_2, 1), \varphi(q_3, 0)) \quad q_1 \geq 0,\ q_2 \geq 1,\ q_3 \geq 0$$

$$M(q_1, q_2 - 1, q_3 - 1) + \text{colcost}(\varphi(q_1, 0), \varphi(q_2, 1), \varphi(q_3, 1)) \quad q_1 \geq 0,\ q_2 \geq 1,\ q_3 \geq 1$$

$$M(q_1 - 1, q_2, q_3) + \text{colcost}(\varphi(q_1, 1), \varphi(q_2, 0), \varphi(q_3, 0)) \quad q_1 \geq 1,\ q_2 \geq 0,\ q_3 \geq 0$$

$$M(q_1 - 1, q_2, q_3 - 1) + \text{colcost}(\varphi(q_1, 1), \varphi(q_2, 0), \varphi(q_3, 1)) \quad q_1 \geq 1,\ q_2 \geq 0,\ q_3 \geq 1$$

$$M(q_1 - 1, q_2 - 1, q_3) + \text{colcost}(\varphi(q_1, 1), \varphi(q_2, 1), \varphi(q_3, 0)) \quad q_1 \geq 1,\ q_2 \geq 1,\ q_3 \geq 0$$

$$M(q_1 - 1, q_2 - 1, q_3 - 1) + \text{colcost}(\varphi(q_1, 1), \varphi(q_2, 1), \varphi(q_3, 1)) \quad q_1 \geq 1,\ q_2 \geq 1,\ q_3 \geq 1 \Big\}$$

$$= \min \Big\{ M(q_1, q_2, q_3 - 1) + colcost(-, -, S_3[q_3]) \quad q_1 \geq 0,\ q_2 \geq 0,\ q_3 \geq 1$$

$$M(q_1, q_2 - 1, q_3) + colcost(-, S_2[q_2], -) \quad q_1 \geq 0,\ q_2 \geq 1,\ q_3 \geq 0$$

$$M(q_1, q_2 - 1, q_3 - 1) + colcost(-, S_2[q_2], S_3[q_3]) \quad q_1 \geq 0,\ q_2 \geq 1,\ q_3 \geq 1$$

$$M(q_1 - 1, q_2, q_3) + colcost(S_1[q_1], -, -) \quad q_1 \geq 1,\ q_2 \geq 0,\ q_3 \geq 0$$

$$M(q_1 - 1, q_2, q_3 - 1) + colcost(S_1[q_1], -, S_3[q_3]) \quad q_1 \geq 1,\ q_2 \geq 0,\ q_3 \geq 1$$

$$M(q_1 - 1, q_2 - 1, q_3) + colcost(S_1[q_1], S_2[q_2], -) \quad q_1 \geq 1,\ q_2 \geq 1,\ q_3 \geq 0$$

$$M(q_1 - 1, q_2 - 1, q_3 - 1) + colcost(S_1[q_1], S_2[q_2], S_3[q_3]) \quad q_1 \geq 1,\ q_2 \geq 1,\ q_3 \geq 1 \Big\}$$