

7-1

第一阶段 $f_1(D_1) = 3$ $f_1(D_2) = 1$ $f_1(D_3) = 5$

第二阶段 $f_2(C_1) = \min \begin{Bmatrix} f_1(D_1) + C_1D_1 \\ f_1(D_2) + C_1D_2 \\ f_1(D_3) + C_1D_3 \end{Bmatrix} = \min \begin{Bmatrix} 5 \\ 6 \\ 8 \end{Bmatrix} = 5$

$f_2(C_2) = \min \begin{Bmatrix} f_1(D_1) + C_2D_1 \\ f_1(D_2) + C_2D_2 \\ f_1(D_3) + C_2D_3 \end{Bmatrix} = \min \begin{Bmatrix} 4 \\ 5 \\ 7 \end{Bmatrix} = 4$

第三阶段 $f_3(B_1) = \min \begin{Bmatrix} f_1(D_1) + B_1D_1 \\ f_2(C_1) + B_1C_1 \\ f_2(C_2) + B_1C_2 \end{Bmatrix} = \min \begin{Bmatrix} 7 \\ 9 \\ 7 \end{Bmatrix} = 7$

$f_3(B_2) = \min \begin{Bmatrix} f_2(C_1) + B_2C_1 \\ f_2(C_2) + B_2C_2 \end{Bmatrix} = \min \begin{Bmatrix} 6 \\ 7 \end{Bmatrix} = 6$

$f_3(B_3) = \min \begin{Bmatrix} f_1(D_3) + B_3D_3 \\ f_2(C_1) + B_3C_1 \\ f_2(C_2) + B_3C_2 \end{Bmatrix} = \min \begin{Bmatrix} 8 \\ 8 \\ 9 \end{Bmatrix} = 8$

第四阶段 $f_4(A) = \min \begin{Bmatrix} AB_1 + f_3(B_1) \\ AB_2 + f_3(B_2) \\ AB_3 + f_3(B_3) \end{Bmatrix} = \min \begin{Bmatrix} 10 \\ 8 \\ 9 \end{Bmatrix} = 8$

即最短路径为 $A \rightarrow B_2 \rightarrow C_1 \rightarrow D_1 \rightarrow E$, 长度为8

HW-7 19040102 自动化一班 方亮

$$7-2 \quad f_1(O) = 2, \quad f_1(P) = 1$$

$$f_2(L) = f_1(O) + OL = 7$$

$$f_2(M) = \min \begin{cases} f_1(O) + OM \\ f_1(P) + MP \end{cases} = \min \begin{cases} 4 \\ 9 \end{cases} = 4$$

$$f_2(N) = f_1(P) + NP = 5$$

$$f_3(H) = f_2(L) + HL = 10$$

$$f_3(I) = \min \begin{cases} IL + f_2(L) \\ IM + f_2(M) \end{cases} = \min \begin{cases} 10 \\ 8 \end{cases} = 8$$

$$f_3(J) = \min \begin{cases} JM + f_2(M) \\ JN + f_2(N) \end{cases} = \min \begin{cases} 6 \\ 10 \end{cases} = 6$$

$$f_3(K) = KN + f_2(N) = 7$$

$$f_4(E) = \min \begin{cases} EH + f_3(H) \\ EI + f_3(I) \end{cases} = \min \begin{cases} 12 \\ 9 \end{cases} = 9$$

$$f_4(F) = \min \begin{cases} FI + f_3(I) \\ FJ + f_3(J) \end{cases} = \min \begin{cases} 9 \\ 8 \end{cases} = 8$$

$$f_4(G) = \min \begin{cases} GJ + f_3(J) \\ GK + f_3(K) \end{cases} = \min \begin{cases} 13 \\ 11 \end{cases} = 11$$

$$f_5(C) = \min \begin{cases} CE + f_4(E) \\ CF + f_4(F) \end{cases} = \min \begin{cases} 14 \\ 12 \end{cases} = 12$$

$$f_5(D) = \min \begin{cases} DF + f_4(F) \\ DG + f_4(G) \end{cases} = \min \begin{cases} 15 \\ 14 \end{cases} = 14$$

$$f_6(A) = \min \begin{cases} AC + f_5(C) \\ AD + f_5(D) \end{cases} = \min \begin{cases} 16 \\ 17 \end{cases} = 16$$

故最短路径为 $A \rightarrow C \rightarrow F \rightarrow J \rightarrow M \rightarrow O \rightarrow B$, 最短距离为 16

HW-7 19040102 自动化一班 方亮

7-5	k=1	x	0	1	2	3	4	5	6
		$f_1(x)$	0	60	80	105	115	130	150

k=2	x	0	1	2	3	4	5	6
	$f_2(x)$	0	65	125	145	170	200	220

最优组合	0 0	0 1	1 1	12/21	13/31	1 4	15/24
------	-----	-----	-----	-------	-------	-----	-------

$$k=3 \quad f_3(6) = \max \left\{ \begin{array}{l} 0 + 180 \\ 65 + 150 \\ 125 + 135 \\ 145 + 120 \\ 170 + 100 \\ 200 + 75 \\ 220 + 0 \end{array} \right\} = 275$$

即甲1人, 24人, 丙1人, 总利润最大, 为275

$$7-9 \quad f_5(13) = \max_{0 \leq x_k \leq [\frac{y}{a_k}]} \{ c_k x_k + f_{k-1}(y - a_k x_k) \}$$

$$= \max \{ 9 + f_4(6), f_4(13) \}$$

$$f_4(6) = \max \{ 4 + f_3(1), f_3(6) \}$$

$$f_4(13) = \max \{ f_3(13), 4 + f_3(9), 8 + f_3(4) \}$$

$$f_3(1) = f_1(1) = 0.5$$

$$f_3(6) = \max \{ f_2(6), 3 + f_2(2) \}$$

$$f_3(13) = \max \{ f_2(13), 3 + f_2(9), 6 + f_2(5), 9 + f_2(1) \}$$

$$f_3(9) = \max \{ f_2(9), 3 + f_2(5), 6 + f_2(1) \}$$

$$f_3(4) = \max \{ f_2(4), 3 \}$$

HW-7 190410102 自动化一班 方亮

$$f_2(6) = \max\{3, 1.5+2, 4\} = 4$$

$$f_2(2) = f_1(2) = 1$$

$$f_2(13) = \max\{6.5, 5.5+2, 4+4, 2.5+6, 1+8\} = 9$$

$$f_2(9) = \max\{4.5, 3+2, 1.5+4, 6\} = 6$$

$$f_2(5) = \max\{2.5, 1+2\} = 3$$

$$f_2(1) = f_1(1) = 2$$

$$f_2(4) = \max\{2, 0.5+2\} = 2.5$$

$$\text{反推 } f_3(4) = 3, f_3(9) = \max\{6, 6, 8\} = 8$$

$$f_3(13) = \max\{9, 9, 9, 11\} = 11$$

$$f_3(6) = \max\{4, 4\} = 4$$

$$f_4(6) = \max\{4+0.5, 4\} = 4.5$$

$$f_4(13) = \max\{11, 12, 11\} = 12$$

$$f_5(13) = \max\{9+4.5, 12\} = 13.5$$

故装入 A, B, E 最大价值为 13.5, 总质量 13kg