

Вариант 8

Var 8 : v3 ---> v5

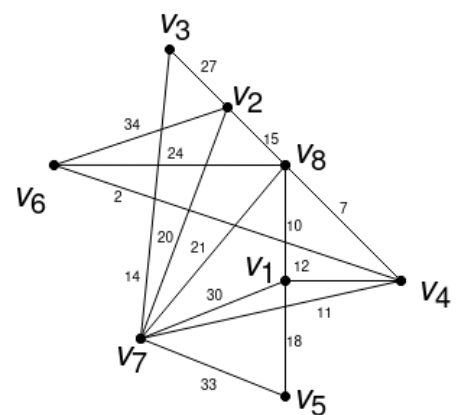
$w(\{v_1, v_4\})=12$, $w(\{v_1, v_5\})=18$, $w(\{v_1, v_7\})=30$, $w(\{v_1, v_8\})=10$, $w(\{v_2, v_3\})=27$,
 $w(\{v_2, v_6\})=34$, $w(\{v_2, v_7\})=20$, $w(\{v_2, v_8\})=15$, $w(\{v_3, v_7\})=14$, $w(\{v_4, v_6\})=2$,
 $w(\{v_4, v_7\})=11$, $w(\{v_4, v_8\})=7$, $w(\{v_5, v_7\})=33$, $w(\{v_6, v_8\})=24$, $w(\{v_7, v_8\})=21$.

$$W_{ij} = \begin{cases} 0 & \text{если, } i = j \\ w(\{v_i, v_j\}) & \text{если } \{v_i, v_j\} \in E \\ \infty & \text{если } \{v_i, v_j\} \notin E \end{cases}$$

$$W_{ij} = \begin{matrix} & 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ & \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ & \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty \\ 12 & \infty & \infty & 0 & \infty & 2 & 11 & 7 \\ 18 & \infty & \infty & \infty & 0 & \infty & 33 & \infty \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & 24 \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 \\ 10 & 15 & \infty & 7 & \infty & 24 & 21 & 0 \end{matrix}$$

1. По алгоритму Флойда-Уоршалла

$$L^{(0)} = W \quad P_{ij}^{(0)} = \begin{cases} j & \text{если } W_{ij} \neq \infty \\ 0 & \text{если } W_{ij} = \infty \end{cases}$$



$$L^{(0)} = \begin{matrix} & 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ & \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ & \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty \\ 12 & \infty & \infty & 0 & \infty & 2 & 11 & 7 \\ 18 & \infty & \infty & \infty & 0 & \infty & 33 & \infty \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & 24 \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 \\ 10 & 15 & \infty & 7 & \infty & 24 & 21 & 0 \end{matrix}$$

$$P^{(0)} = \begin{matrix} & 1 & 0 & 0 & 4 & 5 & 0 & 7 & 8 \\ & 0 & 2 & 3 & 0 & 0 & 6 & 7 & 8 \\ & 0 & 2 & 3 & 0 & 0 & 0 & 7 & 0 \\ 1 & 0 & 0 & 4 & 0 & 6 & 7 & 8 \\ 1 & 0 & 0 & 0 & 5 & 0 & 7 & 0 \\ 0 & 2 & 0 & 4 & 0 & 6 & 0 & 8 \\ 1 & 2 & 3 & 4 & 5 & 0 & 7 & 8 \\ 1 & 2 & 0 & 4 & 0 & 6 & 7 & 8 \end{matrix}$$

Шаги алгоритма

$$L_{ij}^{(1)} = \min(L_{ij}^{(0)}, L_{il}^{(0)} + L_{lj}^{(0)})$$

$$P_{ij}^{(1)} = \begin{cases} P_{ij}^{(0)} & \text{если } L_{ij}^{(0)} \leq L_{il}^{(0)} + L_{lj}^{(0)} \\ P_{il}^{(0)} & \text{если } L_{ij}^{(0)} > L_{il}^{(0)} + L_{lj}^{(0)} \end{cases}$$

$$L_{ij}^{(k)} = \min(L_{ij}^{(k-1)}, L_{ik}^{(k-1)} + L_{kj}^{(k-1)})$$

$$P_{ij}^{(k)} = \begin{cases} P_{ij}^{(k-1)} & \text{если } L_{ij}^{(k-1)} \leq L_{ik}^{(k-1)} + L_{kj}^{(k-1)} \\ P_{ik}^{(k-1)} & \text{если } L_{ij}^{(k-1)} > L_{ik}^{(k-1)} + L_{kj}^{(k-1)} \end{cases}$$

$k=1$

$$L^{(1)} = \begin{array}{c|ccccccc} 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty \\ 12 & \infty & \infty & 0 & [30] & 2 & 11 & 7 \\ 18 & \infty & \infty & [30] & 0 & \infty & 33 & [28] \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & 24 \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 \\ 10 & 15 & \infty & 7 & [28] & 24 & 21 & 0 \end{array}$$

$$P^{(1)} = \begin{array}{c|cccccccc} 1 & 0 & 0 & 4 & 5 & 0 & 7 & 8 \\ 0 & 2 & 3 & 0 & 0 & 6 & 7 & 8 \\ 0 & 2 & 3 & 0 & 0 & 0 & 7 & 0 \\ 1 & 0 & 0 & 4 & [1] & 6 & 7 & 8 \\ 1 & 0 & 0 & [1] & 5 & 0 & 7 & [1] \\ 0 & 2 & 0 & 4 & 0 & 6 & 0 & 8 \\ 1 & 2 & 3 & 4 & 5 & 0 & 7 & 8 \\ 1 & 2 & 0 & 4 & [1] & 6 & 7 & 8 \end{array}$$

$k=2$

$$L^{(2)} = \begin{array}{c|ccccccc} 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ \infty & 27 & 0 & \infty & \infty & [61] & 14 & [42] \\ 12 & \infty & \infty & 0 & 30 & 2 & 11 & 7 \\ 18 & \infty & \infty & 30 & 0 & \infty & 33 & 28 \\ \infty & 34 & [61] & 2 & \infty & 0 & [54] & 24 \\ 30 & 20 & 14 & 11 & 33 & [54] & 0 & 21 \\ 10 & 15 & [42] & 7 & 28 & 24 & 21 & 0 \end{array}$$

$$P^{(2)} = \begin{array}{c|cccccccc} 1 & 0 & 0 & 4 & 5 & 0 & 7 & 8 \\ 0 & 2 & 3 & 0 & 0 & 6 & 7 & 8 \\ 0 & 2 & 3 & 0 & 0 & [2] & 7 & [2] \\ 1 & 0 & 0 & 4 & 1 & 6 & 7 & 8 \\ 1 & 0 & 0 & 1 & 5 & 0 & 7 & 1 \\ 0 & 2 & [2] & 4 & 0 & 6 & [2] & 8 \\ 1 & 2 & 3 & 4 & 5 & [2] & 7 & 8 \\ 1 & 2 & [2] & 4 & 1 & 6 & 7 & 8 \end{array}$$

$L^{(3)}=L^{(4)}; k=4$

$$L^{(4)} = \begin{array}{c|ccccccc} 0 & \infty & \infty & 12 & 18 & [14] & [23] & 10 \\ \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ \infty & 27 & 0 & \infty & \infty & 61 & 14 & 42 \\ 12 & \infty & \infty & 0 & 30 & 2 & 11 & 7 \\ 18 & \infty & \infty & 30 & 0 & [32] & 33 & 28 \\ [14] & 34 & 61 & 2 & [32] & 0 & [13] & [9] \\ [23] & 20 & 14 & 11 & 33 & [13] & 0 & [18] \\ 10 & 15 & 42 & 7 & 28 & [9] & [18] & 0 \end{array}$$

$$P^{(4)} = \begin{array}{c|cccccccc} 1 & 0 & 0 & 4 & 5 & [4] & [4] & 8 \\ 0 & 2 & 3 & 0 & 0 & 6 & 7 & 8 \\ 0 & 2 & 3 & 0 & 0 & 2 & 7 & 2 \\ 1 & 0 & 0 & 4 & 1 & 6 & 7 & 8 \\ 1 & 0 & 0 & 1 & 5 & [1] & 7 & 1 \\ [4] & 2 & 2 & 4 & [4] & 6 & [4] & [4] \\ [4] & 2 & 3 & 4 & 5 & [4] & 7 & [4] \\ 1 & 2 & 2 & 4 & 1 & [4] & [4] & 8 \end{array}$$

$L^{(5)}=L^{(6)}; k=6$

$$L^{(6)} = \begin{array}{c|ccccccc} 0 & [48] & [75] & 12 & 18 & 14 & 23 & 10 \\ [48] & 0 & 27 & [36] & [66] & 34 & 20 & 15 \\ [75] & 27 & 0 & [63] & [93] & 61 & 14 & 42 \\ 12 & [36] & [63] & 0 & 30 & 2 & 11 & 7 \\ 18 & [66] & [93] & 30 & 0 & 32 & 33 & 28 \\ 14 & 34 & 61 & 2 & 32 & 0 & 13 & 9 \\ 23 & 20 & 14 & 11 & 33 & 13 & 0 & 18 \\ 10 & 15 & 42 & 7 & 28 & 9 & 18 & 0 \end{array}$$

$$P^{(6)} = \begin{array}{c|cccccccc} 1 & [4] & [4] & 4 & 5 & 4 & 4 & 8 \\ [6] & 2 & 3 & [6] & [6] & 6 & 7 & 8 \\ [2] & 2 & 3 & [2] & [2] & 2 & 7 & 2 \\ 1 & [6] & [6] & 4 & 1 & 6 & 7 & 8 \\ 1 & [1] & [1] & 1 & 5 & 1 & 7 & 1 \\ 4 & 2 & 2 & 4 & 4 & 6 & 4 & 4 \\ 4 & 2 & 3 & 4 & 5 & 4 & 7 & 4 \\ 1 & 2 & 2 & 4 & 1 & 4 & 4 & 8 \end{array}$$

$k=7$

$$L^{(7)} = \begin{array}{c|ccccccc} 0 & [43] & [47] & 12 & 18 & 14 & 23 & 10 \\ [43] & 0 & 27 & [31] & [53] & [33] & 20 & 15 \\ [47] & 27 & 0 & [25] & [47] & [27] & 14 & [32] \\ 12 & [31] & [25] & 0 & 30 & 2 & 11 & 7 \\ 18 & [53] & [47] & 30 & 0 & 32 & 33 & 28 \\ 14 & [33] & [27] & 2 & 32 & 0 & 13 & 9 \\ 23 & 20 & 14 & 11 & 33 & 13 & 0 & 18 \\ 10 & 15 & [32] & 7 & 28 & 9 & 18 & 0 \end{array}$$

$$P^{(7)} = \begin{array}{c|cccccccc} 1 & [4] & [4] & 4 & 5 & 4 & 4 & 8 \\ [7] & 2 & 3 & [7] & [7] & [7] & 7 & 8 \\ [7] & 2 & 3 & [7] & [7] & [7] & 7 & [7] \\ 1 & [7] & [7] & 4 & 1 & 6 & 7 & 8 \\ 1 & [7] & [7] & 1 & 5 & 1 & 7 & 1 \\ 4 & [4] & [4] & 4 & 4 & 6 & 4 & 4 \\ 4 & 2 & 3 & 4 & 5 & 4 & 7 & 4 \\ 1 & 2 & [4] & 4 & 1 & 4 & 4 & 8 \end{array}$$

$k=8$

$$L^{(8)} = \begin{array}{c|ccccccc} 0 & [25] & [42] & 12 & 18 & 14 & 23 & 10 \\ [25] & 0 & 27 & [22] & [43] & [24] & 20 & 15 \\ [42] & 27 & 0 & 25 & 47 & 27 & 14 & 32 \\ 12 & [22] & 25 & 0 & 30 & 2 & 11 & 7 \\ 18 & [43] & 47 & 30 & 0 & 32 & 33 & 28 \\ 14 & [24] & 27 & 2 & 32 & 0 & 13 & 9 \\ 23 & 20 & 14 & 11 & 33 & 13 & 0 & 18 \\ 10 & 15 & 32 & 7 & 28 & 9 & 18 & 0 \end{array}$$

$$P^{(8)} = \begin{array}{c|cccccccc} 1 & [8] & [8] & 4 & 5 & 4 & 4 & 8 \\ [8] & 2 & 3 & [8] & [8] & [8] & 7 & 8 \\ [7] & 2 & 3 & 7 & 7 & 7 & 7 & 7 \\ 1 & [8] & 7 & 4 & 1 & 6 & 7 & 8 \\ 1 & [1] & 7 & 1 & 5 & 1 & 7 & 1 \\ 4 & [4] & 4 & 4 & 4 & 6 & 4 & 4 \\ 4 & 2 & 3 & 4 & 5 & 4 & 7 & 4 \\ 1 & 2 & 4 & 4 & 1 & 4 & 4 & 8 \end{array}$$

Маршрут из v_3 в v_5 . Вес маршрута $L_{35}=47$.

$$s_0=v_3, k_3=P_{35}=7, s_1=v_7, k_7=P_{75}=5, s_2=v_5$$

Маршрут через v_7 . $v_3 v_7 v_5$

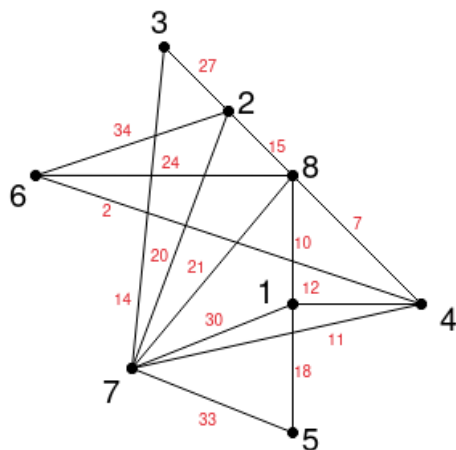
3. По алгоритму Дейкстры

k	$T(k)$	1	2	3	4	5	6	7	8	$m(k)$
0	L	∞	∞	0	∞	∞	∞	∞	∞	3
	P	0	0	0	0	0	0	0	0	
	C	0	0	1	0	0	0	0	0	
1	L	∞	27	0	∞	∞	∞	14	∞	7
	P	0	3	0	0	0	0	3	0	
	C	0	0	1	0	0	0	1	0	
2	L	44	27	0	25	47	∞	14	35	4
	P	7	3	0	7	7	0	3	7	
	C	0	0	1	1	0	0	1	0	
3	L	37	27	0	25	47	27	14	32	5
	P	4	3	0	7	7	4	3	4	
	C	0	0	1	1	1	0	1	0	

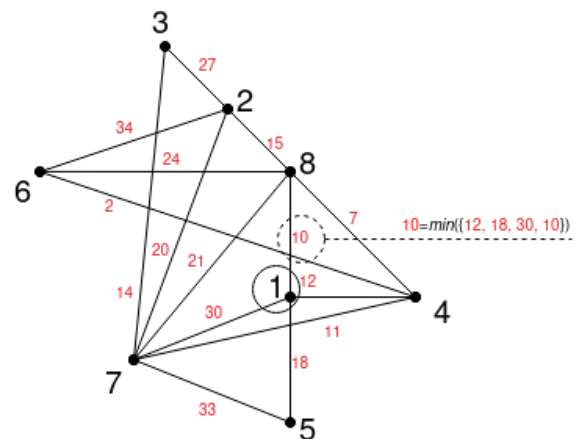
$$W = \begin{vmatrix} 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty \\ 12 & \infty & \infty & 0 & \infty & 2 & 11 & 7 \\ 18 & \infty & \infty & \infty & 0 & \infty & 33 & \infty \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & 24 \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 \\ 10 & 15 & \infty & 7 & \infty & 24 & 21 & 0 \end{vmatrix}$$

Маршрут (извлекается с конца): P: $3 \leftarrow 7 \leftarrow 5$

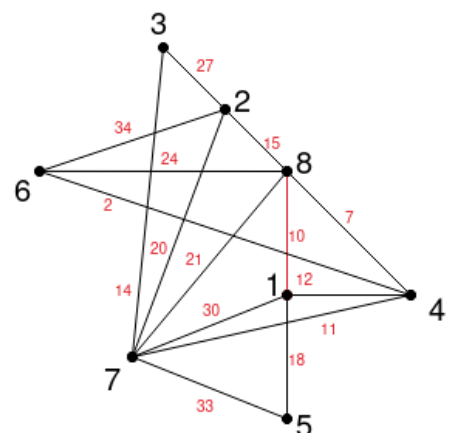
4. По алгоритму Прима



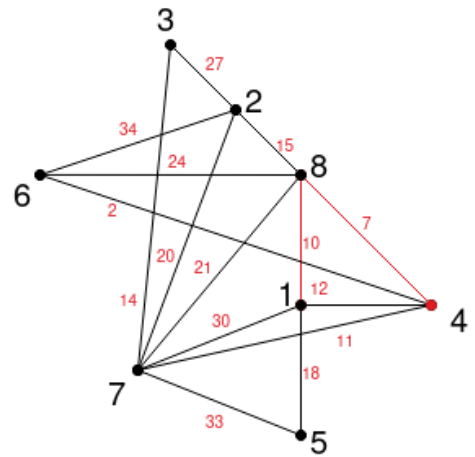
$$W = \begin{vmatrix} 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty \\ 12 & \infty & \infty & 0 & \infty & 2 & 11 & 7 \\ 18 & \infty & \infty & \infty & 0 & \infty & 33 & \infty \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & 24 \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 \\ 10 & 15 & \infty & 7 & \infty & 24 & 21 & 0 \end{vmatrix}$$



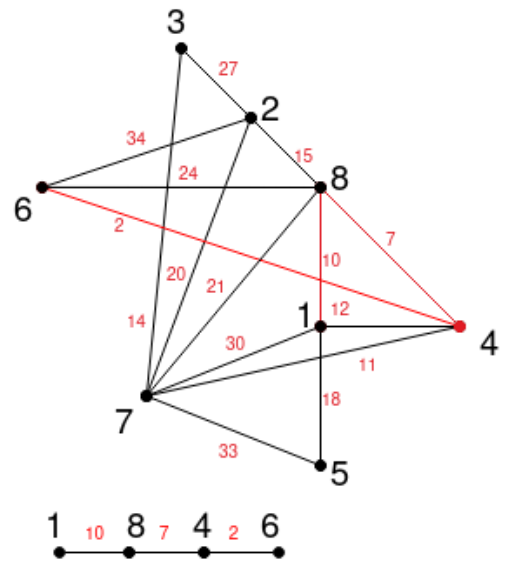
$$W = \begin{vmatrix} 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 \\ \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 \\ \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty \\ 12 & \infty & \infty & 0 & \infty & 2 & 11 & 7 \\ 18 & \infty & \infty & \infty & 0 & \infty & 33 & \infty \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & 24 \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 \\ 10 & 15 & \infty & 7 & \infty & 24 & 21 & 0 \\ U & & & & & & & U \end{vmatrix} *$$



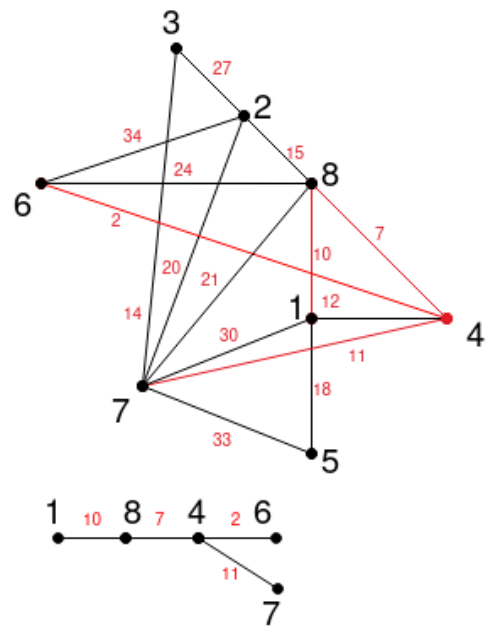
W =		∞	∞	12	18	∞	30	*
	0	27	∞	∞	34	20		
	27	0	∞	∞	∞	14		
	∞	∞	0	∞	2	11		
	∞	∞	∞	0	∞	33		
	34	∞	2	∞	0	∞		
	20	14	11	33	∞	0		
	15	∞	7	∞	24	21		*
	U		U			U		

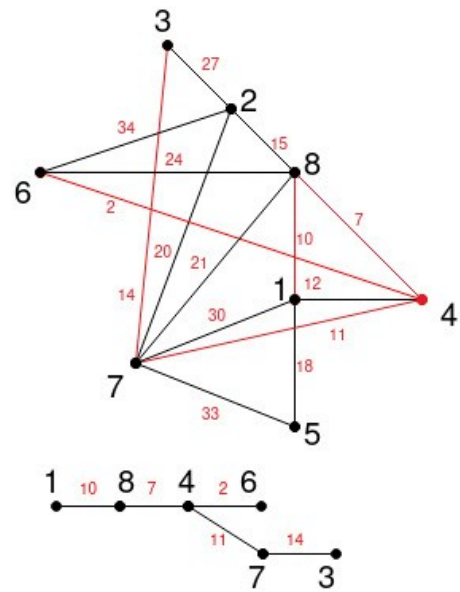


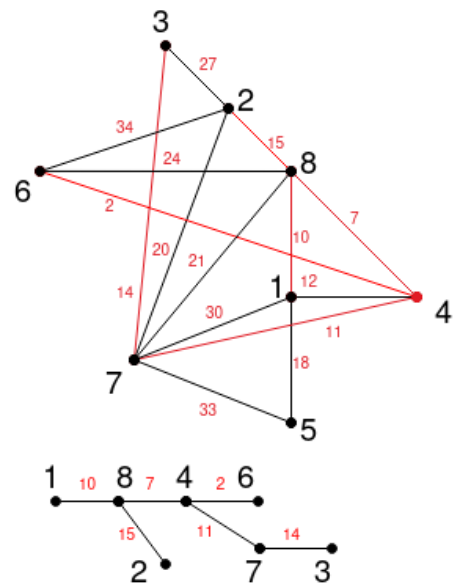
W =		∞	∞	18	∞	30	*
		0	27	∞	34	20	
		27	0	∞	∞	14	
		∞	∞	∞	2	11	*
		∞	∞	0	∞	33	
		34	∞	∞	0	∞	
		20	14	33	∞	0	
		15	∞	∞	24	21	*
	U		U		U		U



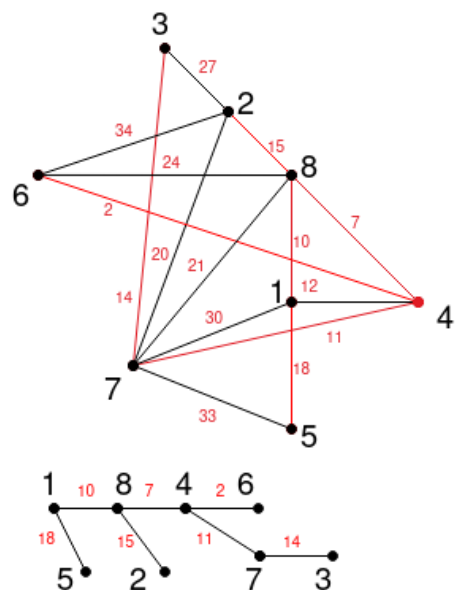
W =		∞	∞	18	30	*		
	0	27	∞	20				
	27	0	∞	14				
	∞	∞	∞	11		*		
	∞	∞	0	33				
	34	∞	∞	∞		*		
	20	14	33	0				
	15	∞	∞	21		*		
	U		U		U	U	U	



$$W = \begin{array}{c|cccc|cccc} & & \infty & \infty & & 18 & & & & * \\ & 0 & 27 & & & \infty & & & & * \\ & 27 & 0 & & & \infty & & & & * \\ & \infty & \infty & & & 0 & & & & * \\ & \infty & \infty & & & \infty & & & & * \\ & 34 & \infty & & & \infty & & & & * \\ & 20 & 14 & & & 33 & & & & * \\ & 15 & \infty & & & \infty & & & & * \\ U & & U & U & & & U & U & U & \end{array}$$


$$W = \begin{array}{c|cccc|cccc} & & \infty & & & 18 & & & & * \\ & 0 & & & & \infty & & & & * \\ & 27 & & & & \infty & & & & * \\ & \infty & & & & \infty & & & & * \\ & \infty & & & & 0 & & & & * \\ & 34 & & & & \infty & & & & * \\ & 20 & & & & 33 & & & & * \\ & 15 & & & & \infty & & & & * \\ U & U & U & U & & & U & U & U & \end{array}$$


$$W = \begin{array}{c|cccc|cccc} & & & & & 18 & & & & * \\ & & & & & \infty & & & & * \\ & & & & & \infty & & & & * \\ & & & & & \infty & & & & * \\ & & & & & 0 & & & & * \\ & & & & & \infty & & & & * \\ & & & & & 33 & & & & * \\ & & & & & \infty & & & & * \\ U & U & U & U & & & U & U & U & \end{array}$$

$$W = \begin{array}{c|cccc|cccc} & 0 & \infty & \infty & 12 & 18 & \infty & 30 & 10 & * \\ & \infty & 0 & 27 & \infty & \infty & 34 & 20 & 15 & * \\ & \infty & 27 & 0 & \infty & \infty & \infty & 14 & \infty & * \\ 12 & \infty & \infty & 0 & \infty & \infty & 2 & 11 & 7 & * \\ 18 & \infty & \infty & \infty & 0 & \infty & 33 & \infty & \infty & * \\ \infty & 34 & \infty & 2 & \infty & 0 & \infty & \infty & 24 & * \\ 30 & 20 & 14 & 11 & 33 & \infty & 0 & 21 & \infty & * \\ 10 & 15 & \infty & 7 & \infty & 24 & 21 & 0 & \infty & * \\ U & U & U & U & U & U & U & U & U & \end{array}$$


$$\mathbf{W} = 10+7+2+11+14+15+18=77$$