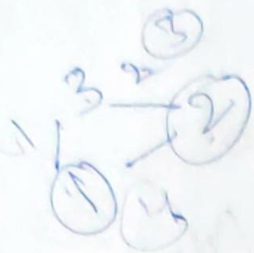
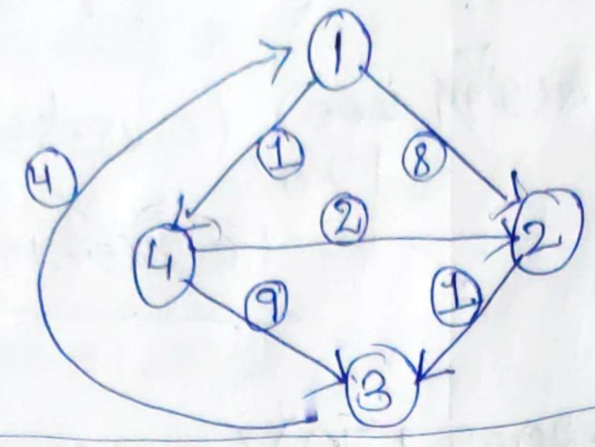
All pairs Shortest path problem:





Formula:

$$\boxed{A^{K}(i,j) = A^{K-1}(i,j),\ A^{K-1}(i,K) + A^{K-1}(K,j)}$$

Process: A^0 A^1 A^2 A^3 A^4

A^0	1	2	3	4
1	0	8	∞	1
2	∞	0	1	∞
3	4	∞	0	∞
4	∞	2	9	0

A' Calculation:

$A^1(2,3) = \min[A^0(2,3), A^0(2,1)+A^0(1,3)]$

$= \min[1, \infty+]$

$= 1$

$A^1(2,4) = \min[A^0(2,4), A^0(2,1)+A^0(1,4)]$

$= \min[\infty, \infty+4]$

$= \infty$

$A^1(3,2) = \min[A^0(3,2), A^0(3,1)+A^0(1,2)]$

$= \min(\infty, 4+8)$

$A^1(3,4) = \min[A^0(3,4), A^0(3,1)+A^0(1,4)]$

$= (\infty, 4+1)$

$= 5$

A^1	1	2	3	4
1	0	8	∞	1
2	∞	0	1	∞
3	4	12	0	5
4	∞	2	9	0

$A^1(4,2) = \min[A^0(4,2), A^0(4,1)+A^0(1,2)]$

$= \min[2, \infty]$

$= 2$

$A^1(4,3) = \min[9, \infty]$

$= 9$

Calculating A^2

A^2	1	2	3	4
1	0	8	9	1
2	∞	0	1	∞
3	4	12	0	5
4	∞	2	3	0

* $A^2 = (A^1(1,3), A^1(1,2)+A^1(2,3))$

$= \infty, 8+1$

$= 9$

* $A^2(1,4) = [A^1(1,4); A^1(1,2)+A^1(2,4)]$

$= \min[1, 8+\infty]$

$= 1$

* $A^2(3,1) = [A^1(3,1), A^1(3,2)+A^1(2,1)]$

$= [4, 12+\infty]$

$= \underline{4}$

* $A^2(3,4) \overset{\min}{=} [A^1(3,4), A^1(3,2)+A^1(2,4)]$

$= \min(5, 12+\infty)$

$= \underline{\underline{5}}$

* $A^2(4,1) = \min[A^1(4,1), A^1(4,2)+A^1(2,1)]$

$= \min[\infty, 2+\infty]$

$= \infty$

* $A^2(4,3) = \min[A^1(4,3), A^1(4,2)+A^1(2,3)]$

$= \min[9, 2+1]$

$= \min[9,3] = \underline{\underline{3}}$

A^3	1	2	3	4
1	0	8	9	1
2	5	0	1	6
3	4	12	0	5
4	$\cancel{\infty}$ 7	2	3	0

$$A^3(1,2) = \min\left(A^2(1,2),\ A^2(1,3) + A^2(3,2)\right)$$
$$= \min(8,\ 9+12)$$
$$= \underline{\underline{8}}$$

$$A^3(1,4) = \min\left(A^2(1,4),\ A^2(1,3) + A^2(3,4)\right)$$
$$= \min(1,\ 9+5)$$
$$= 1$$

$$A^3(2,1) = \min\left(A^2(2,1),\ A^2(2,3) + A^2(3,1)\right)$$
$$= \min(\infty,\ 1+4) = \underline{\underline{5}}$$

$$A^3(2,4) = \min\left[A^2(2,4),\ A^2(2,3) + A^2(3,4)\right]$$
$$= \min[\infty,\ 1+5] = \underline{\underline{6}}$$

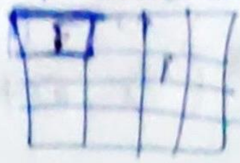
$$A^3(4,1) = \min\left[A^2(4,1),\ A^2(4,3) + A^2(3,1)\right]$$
$$= \min[\infty,\ 3+4]$$
$$= \cancel{\infty}\ \underline{\underline{7}}$$

$$A^3(4,2) = \min\left[A^2(4,2),\ A^2(4,3) + A^2(3,2)\right]$$
$$= \min[2,\ 3+12] = 2$$

gso final

A^3	1	2	3	4
1	0	8	9	1
2	5	0	1	6
3	4	12	0	5
4	~~∞~~ 7	2	3	0

1 = column number.



K = Queen numbers
1, 2, 3, 4

n = 4

A^4	1	2	3	4
1	0	3	4	1
2	5	0	1	6
3	4	7	0	5
4	~~∞~~ 7	2	3	0

$A^4(1,2) = \min(A^3(1,2),\ A^3(1,4) + A^3(4,2))$
$= (8,\ 1+2)$
$= \min(8, 3)$

$A^4(1,3) = \min(A^3(1,3),\ A^3(1,4) + A^3(4,3))$
$= \min(9,\ 1+3) = \underline{4}$

$A^4(2,1) = \min(A^3(2,1),\ A^3(2,4) + A^3(4,1))$
$= \min(5,\ 6+\infty) = \underline{5}$

$A^4(2,3) = \min(A^3(2,3),\ A^3(2,4) + A^3(4,3))$
$= ((1,\ 6+3)$
$= (1, 9) = \underline{1}$

$A^4(3,1) = A^3(3,1),\ A^3(3,4) + A^3(4,1)$

$= \cancel{A^3}\ (4,\ 0+\infty)\ \min = \underline{4}$

$A^4(3,2) = (A^3(3,2),\ A^3(3,4) + A^3(4,2))\ \min$

$= \min(12,\ 5+2)$

$= \underline{\underline{7}}$

A^4	1	2	3	4
1	0	3	4	1
2	5	0	1	6
3	4	7	0	5
4	~~7~~	2	3	0

✓

2b

A-

$n=4$ P1 1

$m=7$ P2 4

P3 5

P4 7

Assessment - II

(3b)

	P	W
A	1	1
B	4	3
C	5	4
D	7	5

$n=4$

$m=7$

$(\cancel{0,1,1,0})$

Formulas:

$S^{i} = S^{i-1} \cup S_1^{i-1}$

$S_1^{i-1} = \{P+P_i, W+W_i\}$

$S^1 = S^0 \cup S_1^0$ $1+0=1$ $S^0 = \{0,0\}$ $P \cdot W$

$=$

$S_1^0 = \{0+1, 0+1\}$

$1+0=1$

$= \{1,1\}$

$S^1 = \{(0,0), (1,1)\}$

$S_1^1 = \{(0+4, 0+3)(1+4, 3+1)\}$

$S^2 = S^1 \cup S_1^1$

$S_1^1 = \{(4,3)(5,4)\}$

$= \{(0,0), (1,1)\} \cup \{(4,3)(5,4)\}$

$= \{(0,0)(1,1)(4,3)(5,4)\}$

Dom!

$(P_i\ W_i)\ (P_j W_j)$

$P_i \le P_j \quad W_i \ge W_j$

$S^3 = S^2 \cup S_1^2$

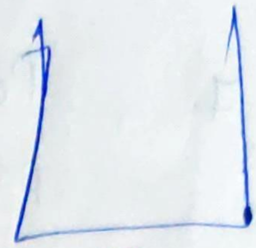
$= \{(0,0)(1,1)(4,3)(5,4)\} \cup \{(5,4)(6,5)(9,7)\cancel{(10,8)}\}$

$= \{(0,0)(1,1)(4,3)(5,4)(6,5)(9,7)\}$

$S^3 = \{(0,0)\ (1,1)\ (4,3)\ (5,4)\ (6,5)\ (9,7)\}$

$S^4 = S^3 \cup S_1^2$ 7,5.

$= \{$



7

$S_1^2 = \{(7,5)\ (8,6)\ (11,8)\ (\cancel{12,9})\ (\cancel{13,10})\ (\cancel{7})\}$

$S_1^2 = \{(7,5)\ (8,6)\ (\cancel{11,8})\}$

$S^4 = \{(0,0)\ (1,1)\ (4,3)\ (5,4)\ (\cancel{6,5})\ (7,5)\ (8,6)\ (9,7)\}$

$= \{(0,0)\ (1,1)\ (4,3)\ (5,4)\ (7,5)\ (8,6)\ (9,7)\}$

$9,7 \in S^3$ $\qquad x_4 = 0$

$9,7 \notin S^2$ $\qquad x_3 = 1$

$4,3 \notin S^1$ $\qquad x_2 = 1$

$0,0 \in S^0$ $\qquad x_1 = 0$

$\in = 0$

$\notin = 1$

$\begin{array}{cccc} x_1 & x_2 & x_3 & x_4 \\ (0, & 1, & 1, & 0) \end{array}$

$N=3$

	c_i	r_i	u_i
D1	50	0.7	2
D2	60	0.3	2
D3	30	0.9	3

$C = 210$

$$\sum c = c_1 + c_2 + c_3 = 50 + 60 + 30 = 140.$$

$$C - \sum c_i = 210 - 140$$

$$C - \sum c_i = 70.$$

$$U_1 = \left\lfloor \frac{C - \sum c_i}{c_i} \right\rfloor + 1 = \left\lfloor \frac{70}{50} \right\rfloor + 1 = \lfloor 1.4 \rfloor + 1 = 2$$

$$U_2 = \left\lfloor \frac{70}{60} \right\rfloor + 1 = \lfloor 1.16 \rfloor + 1 = 2$$

$$U_3 = \left\lfloor \frac{70}{30} \right\rfloor + 1 = \lfloor 2.33 \rfloor + 1 = 3.$$

$S^0 = \{1, 0\}$

$S^1 = S^1_1 + S^1_2$

$S^1_1 = \{1 \times 0.7, 0 + 50\} = \{0.7, 50\}$

$S^1_2 = \{1 \times 0.91, 0 + 100\}$

$S^1_2 = \{0.91, 100\}$

$S^1 = \{(0.7, 50)\ (0.91, 100)\}$

Calculate Reylibity

$1 - (1 - r_1)^2$

$1 - (1 - 0.7)^2$

$1 - 0.09$

$0.91, 100$

$$S^2 = S_1^2 + S_2^2$$

$$S_1^2 = \{(0.7\times 0.3,\ 50+60),\ (0.91\times 0.3,\ 100+60)\}$$

$$S_1^2 = \{(0.21,\ 110),\ (0.273,\ 160)\}$$

$$S_2^2 = \{(0.7\times 0.51,\ 50+\underset{90}{120}),\ \{ \qquad = 1-(1-r_1)^2$$

$$S_2^2 = \{0.357,\ 170\} \quad \cancel{(0.273\times 0.51,\ 160+120)} \quad \cancel{(0.91\times 0.51,\ 120+100)} \qquad = 1-(1-0.3)^2$$

$$1-0.49$$

$$= \underline{0.51},\ c = 120$$

$$S^2 = \{(0.21,\ 110),\ (0.273,\ 160),\ (0.357,\ 170)\}$$

$$S^3 = S_1^3 + S_2^3 + S_3^3$$

$$S_1^3 = \{(0.21\times 0.9,\ 110+30),\ (0.273\times 0.9,\ 160+30),\ (0.357\times 0.9,\ 170+30)\}$$

$$S_1^3 = \{(0.189,\ 140),\ (0.2457,\ 190)\ (0.3213,\ 200)\}$$

$$S_2^3 = \{\cancel{0.189\times 0.99,\ 140+60}\}\ \{(0.21\times 0.99,\ 110+60) \qquad = 1-(1-r_1)^2$$

$$(0.273\times 0.99,\ \cancel{160}+60) \qquad 1-(1-0.9)^2$$

$$S_2^3 = \{\cancel{0.1871,\ 200}\}\ \{\ \{0.2079,\ \underset{170}{200}\} \qquad = 1-(0.01)$$

$$= \underline{0.99,\ 60}$$

$$S_3^3 = \{(0.21\times 0.999,\ 200)\ (\ x\ )\ (\ x\ )\}$$

$$1-(1-r_1)^3$$

$$S_3^3 = \{(0.20979,\ 200)\}$$

$$1-(1-0.9)^3$$

$$1-0.001$$

$$\underline{0.999}\ (90)$$

$S^3 = \{ (0.189, 140) (0.2457, 190) (0.3213, 200)$

$(0.2079, 200) (0.20979, 200) \}$

$S^3 = \{ (0.189, 140) (0.2079, \cancel{200}\ 170), (0.2079, 200)$

$(0.2457, 190) (0.3213, 200) \}$

$S^3 = \{ (0.189, 140) (0.2079, 170) (0.2457, 190)$

$(0.3213, 200) \}$

~~(1,2,1)~~ $(0.3213, 200)$ more Relayability.

$D_3 = 1$

$D_2 = 2$

$D_1 = 1$

20