	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}
	x_1	x_2						3	4	5
X	1	2	3	4	5	1	2	5	4	
Y	y_1 3	y_2 4	1	2	1	4	1	2		

	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}
D_1	0									
D_2	1.4	0								
D_3	2.8	3.1	0							
D_4	3.1	2.8	1.4	0						
D_5	4.5	4.2	2	1.4	0					
D_6	1	1	3.6	3.6	5	0				
D_7	2.2	3	1	2.2	3	3.1	0			
D_8	2	2.2	1	1	2.2	2.8	1.4	0		
D_9	3.6	2.2	4.1	3	4.1	3.1	4.4	3.1	0	
D_{10}	4.1	3	3.6	2.2	3	4	4.2	2.8	1.4	0

$$(D_1 D_2) = \sqrt{(2-1)^2+(4-3)^2}$$
$$= \sqrt{1+1}$$
$$= \sqrt{2}$$

$$(D_1 D_3) = \sqrt{(3-1)^2+(1-3)^2}$$
$$= \sqrt{4+(-2)^2}$$
$$= 2.8$$

$$(D_1 D_4) = \sqrt{(4-1)^2+(2-3)^2}$$
$$= \sqrt{9+1}$$
$$= 3.1$$

$$(D_1 D_5) = \sqrt{(5-1)^2+(1-3)^2}$$
$$= \sqrt{16+4}$$
$$= 4.5$$

$(D_1D_6) = \sqrt{(1-1)^2+(4-3)^2}$

$= \sqrt{0+1}$

$= 1$

$(D_1D_7) = \sqrt{(2-1)^2+(1-3)^2}$

$= \sqrt{1+4}$

$= 2.2$

$(D_1D_8) = \sqrt{(3-1)^2+(3-3)^2}$

$= \sqrt{4}$

$= 2$

$(D_1D_9) = \sqrt{(4-1)^2+(5-3)^2}$

$= \sqrt{9+4}$

$= 3.6$

$(D_1D_{10}) = \sqrt{(5-1)^2+(4-3)^2}$

$= \sqrt{16+1}$

$= 4.1$

$(D_2D_3) = \sqrt{(3-2)^2+(1-4)^2}$

$= \sqrt{1+9}$

$= 3.1$

$(D_2D_4) = \sqrt{(4-2)^2+(2-4)^2}$

$= \sqrt{4+4}$

$= 2.8$

$(D_2D_5) = \sqrt{(5-2)^2+(1-4)^2}$

$= \sqrt{9+9}$

$= 4.2$

$(D_2D_6) = \sqrt{(1-2)^2+(4-4)^2}$

$= \sqrt{1}$

$= 1$

$(D_2 D_1) = \sqrt{(2-2)^2+(1-4)^2}$

$= \sqrt{0+9}$

$= 3$

$(D_2 D_8) = \sqrt{(3-2)^2+(2-4)^2}$

$= \sqrt{1+4}$

$= 2.2$

$(D_2 D_9) = \sqrt{(4-2)^2+(5-4)^2}$

$= \sqrt{4+1}$

$= 2.2$

$(D_2 D_{10}) = \sqrt{(5-2)^2+(4-4)^2}$

$= \sqrt{9}$

$= 3$

$(D_3 D_4) = \sqrt{(4-3)^2+(2-1)^2}$

$= \sqrt{1+1}$

$= 1.4$

$(D_3 D_5) = \sqrt{(5-3)^2+(1-1)^2}$

$= \sqrt{4}$

$= 2$

$(D_3 D_6) = \sqrt{(1-3)^2+(4-1)^2}$

$= \sqrt{4+9}$

$= 3.6$

$(D_3 D_7) = \sqrt{(2-3)^2+(1-1)^2}$

$= \sqrt{1}$

$= 1$

$(D_3 D_8) = \sqrt{(3-3)^2+(2-1)^2}$

$= \sqrt{1}$

$= 1$

$(D_3D_9) = \sqrt{(4-3)^2+(5-1)^2}$

$= \sqrt{1+16}$

$= 4.1$

$(D_3D_{10}) = \sqrt{(5-3)^2+(4-1)^2}$

$= \sqrt{4+9}$

$= 3.6$

$(D_4D_5) = \sqrt{(5-4)^2+(1-2)^2}$

$= \sqrt{1+1}$

$= 1.4$

$(D_4D_6) = \sqrt{(1-4)^2+(4-2)^2}$

$= \sqrt{9+4}$

$= 3.6$

$(D_4D_7) = \sqrt{(2-4)^2+(1-2)^2}$

$= \sqrt{4+1}$

$= 2.2$

$(D_4D_8) = \sqrt{(3-4)^2+(2-2)^2}$

$= \sqrt{1}$

$= 1$

$(D_4D_9) = \sqrt{(4-4)^2+(5-2)^2}$

$= \sqrt{9}$

$= 3$

$(D_4D_{10}) = \sqrt{(5-4)^2+(4-2)^2}$

$= \sqrt{1+4}$

$= 2.2$

$(D_6D_6) = \sqrt{(1-5)^2+(4-1)^2}$

$= \sqrt{16+9}$

$= \sqrt{25}$

$= 5$

$(D_5D_7) = \sqrt{(2-5)^2+(1-1)^2}$

$= \sqrt{9}$

$= 3$

$(D_5D_8) = \sqrt{(3-5)^2+(2-1)^2}$

$= \sqrt{4+1}$

$= \sqrt{5}$

$= 2.2$

$(D_5D_9) = \sqrt{(4-5)^2+(5-1)^2}$

$= \sqrt{1+16}$

$= \sqrt{17}$

$= 4.1$

$(D_5D_{10}) = \sqrt{(5-5)^2+(4-1)^2}$

$= \sqrt{9}$

$= 3$

$(D_6D_7) = \sqrt{(2-1)^2+(1-4)^2}$

$= \sqrt{1+9}$

$= \sqrt{10}$

$= 3.1$

$(D_6D_8) = \sqrt{(3-1)^2+(2-4)^2}$

$= \sqrt{4+4}$

$= \sqrt{8}$

$= 2.8$

$(D_6D_9) = \sqrt{(4-1)^2+(5-4)^2}$

$= \sqrt{9+1}$

$= \sqrt{10}$

$= 3.1$

$(D_6D_{10}) = \sqrt{(5-1)^2 + (4-4)^2}$

$= \sqrt{16+0}$

$= 4$

$(D_7D_8) = \sqrt{(3-2)^2 + (2-1)^2}$

$= \sqrt{1+1}$

$= \sqrt{2}$

$= 1.4$

$(D_7D_9) = \sqrt{(4-2)^2 + (5-1)^2}$

$= \sqrt{4+16}$

$= \sqrt{20}$

$= 4.4$

$(D_7D_{10}) = \sqrt{(5-2)^2 + (4-1)^2}$

$= \sqrt{9+9}$

$= \sqrt{18}$

$= 4.2$

$(D_8D_9) = \sqrt{(4-3)^2 + (5-2)^2}$

$= \sqrt{1+9}$

$= \sqrt{10}$

$= 3.1$

$(D_8D_{10}) = \sqrt{(5-3)^2 + (4-2)^2}$

$= \sqrt{4+4}$

$= \sqrt{8}$

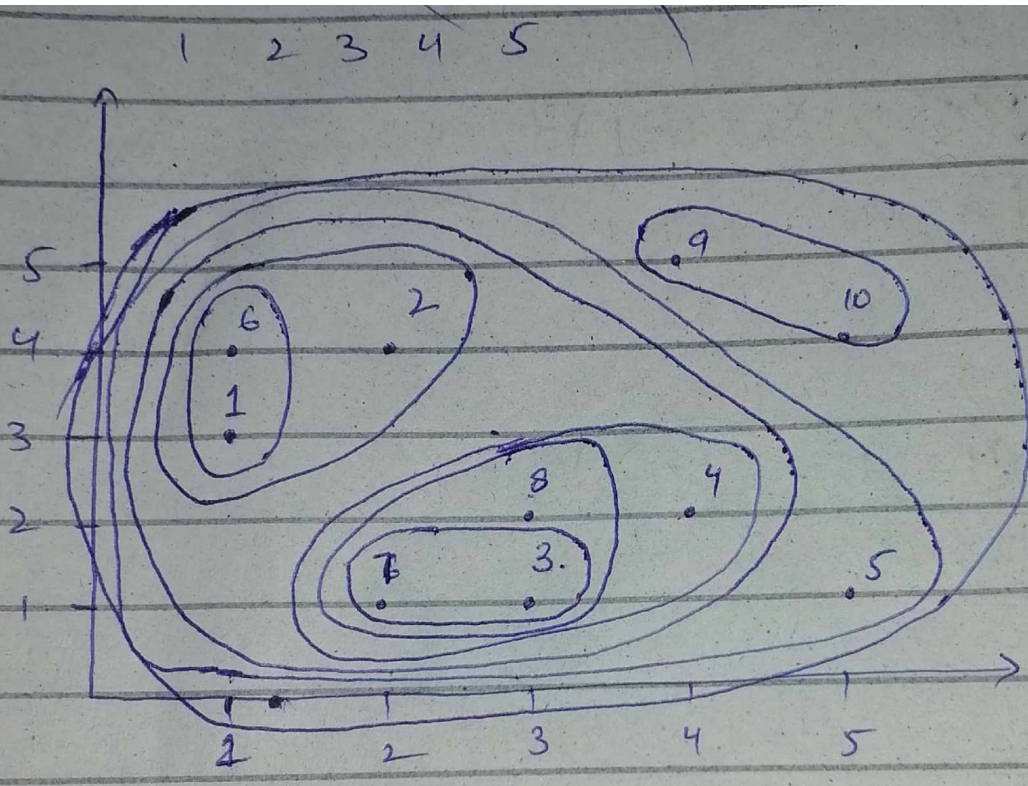
$= 2.8$

$(D_9D_{10}) = \sqrt{(5-4)^2 + (4-5)^2}$

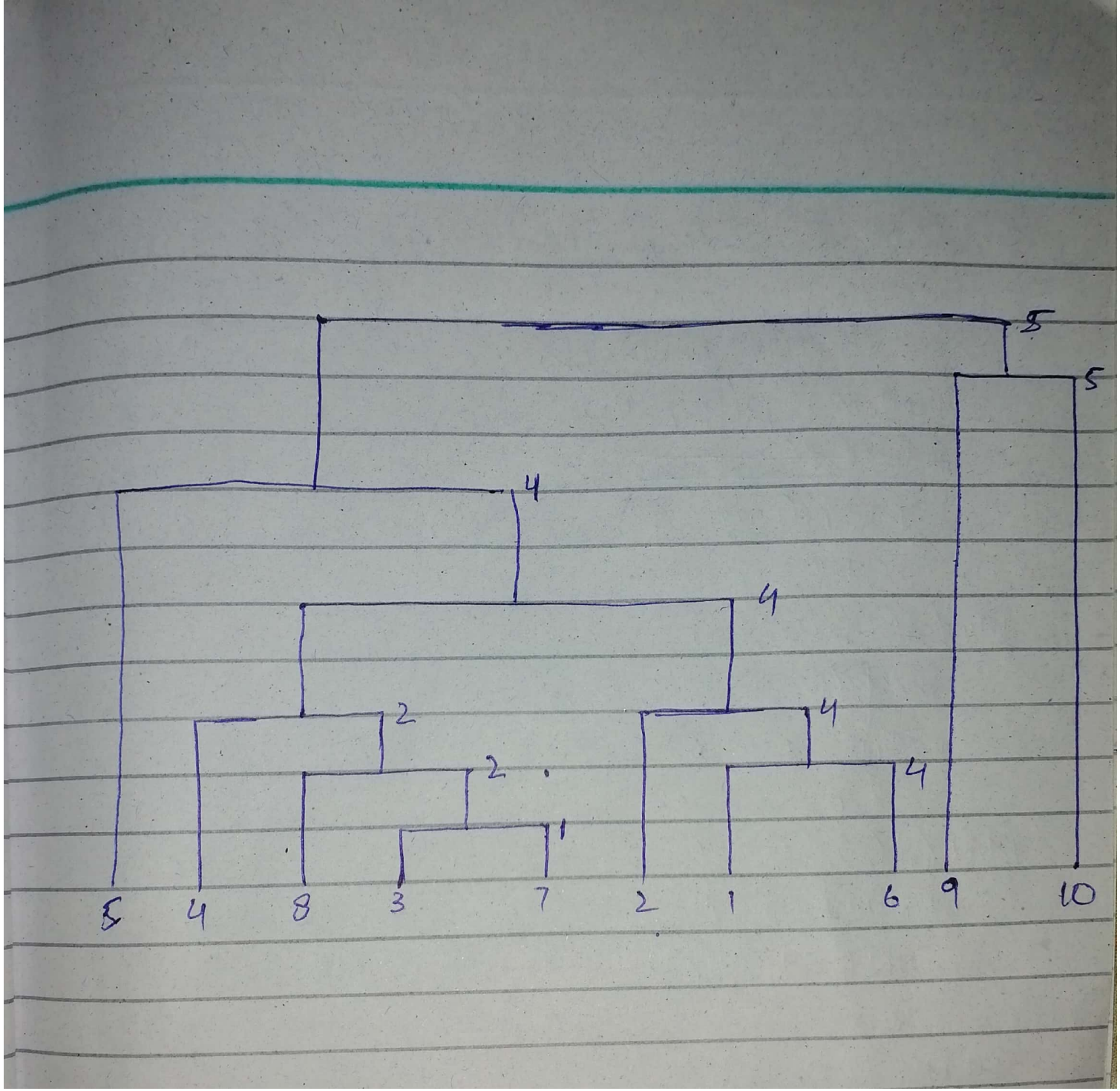
$= \sqrt{1+1}$

$= \sqrt{2}$

$= 1.4$



Clusters for threshold = 3 are 3


5
5
4
4
2
4
2
4
1
5 4 8 3 7 2 1 6 9 10

FIRST Cluster :- D_1, D_6

To update the distance Matrix :-

$MIN(d(D_1, D_6), D_2)$

$= MIN[(D_1 D_2), (D_6, D_2)]$

~~$= MIN(1, 1.4)$~~

$= MIN(1.4, 1)$

$= 1$

$MIN(d(D_1, D_6), D_3)$

$= MIN[(D_1, D_3), (D_6, D_3)]$

$= MIN(2.8, 3.6)$

$= 2.8$

$MIN(d(D_1, D_6), D_4)$

$= MIN[(D_1, D_4), (D_6, D_4)]$

$= MIN(3.1, 3.6)$

$= 3.6$

$MIN(d(D_1, D_6), D_5)$

$= MIN(D_1, D_5), (D_6, D_5)$

$= MIN(4.5, 5)$

$= 4.5$

$MIN(d(D_1, D_6), D_7)$

$MIN[(D_1, D_7), (D_6, D_7)]$

$MIN(2.2, 3.1)$

$= 2.2$

$MIN(d(D_1, D_6), D_8)$

$MIN[(D_1, D_8), (D_6, D_8)]$

$MIN(2, 2.8)$

$= 2$

MIN(d(D1, D6), D9)

MIN[(D1, D9), (D6, D9)]

MIN (3.6, 3.1)

= 3.1

MIN (d(D1, D6), D10)

MIN [(D1, D10), (D6, 10)]

MIN (4.1, 4)

4

~~D1, D6~~

	D1, D6	D2	D3	D4	D5	D7	D8	D9	D10
D1, D6	0								
D2	1	0							
D3	2.8	3.1	0						
D4	3.6	2.8	1.4	0					
D5	4.5	4.2	2	1.4	0				
D7	2.2	3	1	2.2	3	0			
D8	2	2.2	1	1	2.2	1.4	0		
D9	3.1	2.2	4.1	3	4.1	4.4	3.1	0	
D10	4	3	3.6	2.2	3	4.2	2.8	1.4	0

Select new cluster :- D1, D6, D2

Update distance

MIN (d(D1, D6, D2), D3)

MIN [(D1, D6, D3), (D2, D3)]

MIN (2.8, 3.1)

= 2.8

MIN (d(D1, D6, D2), D4)

MIN [(D1, D6, D4), (D2, D4)]

MIN (3.6, 2.8)

= 2.8

MIN ((D1, D6, D2), D5)

MIN [(D1, D6) D5), (D2, D5))

MIN (4.5, 4.2)

= 4.2

MIN ((D1, D6, D2), D4)

MIN [(D1, D6, D4), (D2, D4)]

MIN (2.2, 3)

= 2.2

MIN ((D1, D6, D2), D8)

MIN [(D1, D6, D8), (D2, D8)]

MIN (2, 2.2)

= 2

MIN ((D1, D6, D2), D9)

MIN [(D1, D6, D9), (D2, D9)]

MIN (3.1, 2.2)

= 2.2

MIN ((D1, D6, D2) D10)

MIN [(D1, D6, D10), (D2, D10)]

MIN (4, 3)

= 3

	D1, D6, D2	D3	D4	D5	D7	D8	D9	D10
D1, D6, D2	0							
D3	2.8	0						
D4	2.8	1.4	0					
D5	4.2	2	1.4	0				
D7	2.2	1	2.2	3	0			
D8	2	1	1	2.2	1.4	0		
D9	2.2	4.1	3	4.1	4.4	3.1	0	
D10	3	3.6	2.2	3	4.2	2.8	1.4	0

Select New cluster :- D_3, D_7

Update distance

MIN $[(D_3, D_7), (D_1, D_6, D_2)]$

MIN $[(D_3, (D_1, D_6, D_2), (D_7, (D_1, D_6, D_2)]$

MIN $(2.8, 2.2)$

$= 2.2$

MIN $((D_3, D_7), D_4)$

MIN $[(D_3, D_4), (D_7, D_4)]$

MIN $(1.4, 2.2)$

$= 1.4$

MIN $((D_3, D_7), D_5)$

MIN $[(D_3, D_5), (D_7, D_5)]$

MIN $(2, 3)$

$= 3$

MIN $((D_3, D_7), D_8)$

MIN $[(D_3, D_8), (D_7, D_8)]$

MIN $(1, 1.4)$

$= 1$

MIN $((D_3, D_7), D_9)$

MIN $[(D_3, D_9), (D_7, D_9)]$

MIN $(4.1, 4.4)$

$= 4.1$

MIN $((D_3, D_7), D_{10})$

MIN $[(D_3, D_{10}), (D_7, D_{10})]$

MIN $(3.6, 4.2)$

$= 3.6$

	D_1, D_6, D_2	D_3, D_7	D_4	D_5	D_8	D_9	D_{10}
D_1, D_6, D_2	0						
D_3, D_7	2.2	0					
D_4	2.8	1.4	0				
D_5	4.2	3	1.4	0			
D_8	2	1	1	2.2	0		
D_9	2.2	4.1	3	4.1	3.1	0	
D_{10}	3	3.6	2.2	3	2.8	1.4	0

Select New cluster:- D_3, D_7, D_8

Update distance

$MIN[(D_3, D_7, D_8), (D_1, D_6, D_2)]$

$MIN[((D_3, D_7), (D_1, D_6, D_2)), (D_8, (D_1, D_6, D_2))]$

$MIN[(2.2, 2)]$

$= 2$

$MIN[((D_3, D_7, D_8), D_4)]$

$MIN[((D_3, D_7, D_8), (D_8, D_4))]$

$MIN(1.4, 1)$

$= 1$

$MIN[(D_3, D_7, D_8), D_5]$

$MIN[(D_3, D_7, D_8), (D_8, D_5)]$

$MIN(3, 2.2)$

$= 2.2$

$MIN[(D_3, D_7, D_8), D_9]$

$MIN[(D_3, D_7, D_9), (D_8, D_9)]$

$MIN(4.1, 3.1)$

$= 3.1$

MIN [(D3, D7, D8), D10]

MIN [(D3, D7, D10), (D8, D10)]

MIN (3.6, 2.8)

= 2.8

	D1, D6, D2	D3, D7, D8	D4	D5	D9	D10
D1, D6, D2	0					
D3, D7, D8	2	0				
D4	2.8	[1]	0			
D5	4.2	2.2	1.4	0		
D9	2.2	3.1	3	4.1	0	
D10	3	2.8	2.2	3	1.4	0

Select New cluster :- D3, D7, D8, D4

Update Distance

MIN [(D3, D7, D8, D4), (D1, D6, D2)]

MIN [((D3, D7, D8), (D1, D6, D2)), ((D4, (D1, D6, D2))]

MIN (2, 2.8)

= 2

MIN [(D3, D7, D8, D4), D5]

MIN [(D3, D7, D6, D5), (D4, D5)]

MIN (2.2, 1.4)

= 1.4

MIN [(D3, D7, D8, D4), D9]

MIN [(D3, D7, D8, D9), (D4, D9)]

MIN (3.1, 3)

= 3

MIN [(D3, D7, D8, D4), D10]

MIN [(D3, D7, D8, D10), (D4, D10)]

MIN (2.8, 2.2)

= 2.2

	D_1, D_2, D_6	D_3, D_7, D_8, D_4	D_5	D_9	D_{10}
D_1, D_2, D_6	0				
D_3, D_7, D_8, D_4	2	0			
D_5	4.2	1.4	0		
D_9	2.2	3	4.1	0	
D_{10}	3	2.2	3	1.4	0

Select New cluster :- $D_1, D_2, D_6, D_3, D_7, D_8, D_4$

Update Distance

MIN[$(D_1, D_2, D_6, D_3, D_7, D_8, D_4), D_5$]

MIN[$(D_1, D_2, D_6, D_5), (D_3, D_7, D_8, D_4, D_5)$]

MIN(4.2, 1.4)

= 1.4

MIN[$(D_1, D_2, D_6, D_3, D_7, D_8, D_9), D_9$]

MIN[$(D_1, D_2, D_6, D_9), (D_3, D_7, D_8, D_4, D_9)$]

MIN(2.2, 3)

= 2.2

MIN[$(D_1, D_2, D_6, D_3, D_7, D_8, D_4), D_{10}$]

MIN[$(D_1, D_2, D_6, D_{10}), (D_3, D_7, D_8, D_4, D_{10})$]

MIN(3, 2.2)

= 2.2

	$D_1, D_2, D_6, D_3, D_7, D_8, D_4$	D_5	D_9	D_{10}
$D_1, D_2, D_6, D_3, D_7, D_8, D_4$	0			
D_5	1.4	0		
D_9	2.2	4.1	0	
D_{10}	2.2	3	1.4	0

Select new cluster :-

$D_1, D_2, D_6, D_3, D_7, D_8, D_4, D_5$

$D_\Delta = D_1, D_2, D_6, D_3, D_7, D_8, D_4, D_5$

Update Distance

MIN [(D_Δ, D_5), D_9]

MIN [(D_Δ, D_9), (D_5, D_9)]

MIN (2.2, 4.1)

= 2.2

MIN [(D_Δ, D_5), D_10]

MIN [(D_Δ, D_10), (D_5, D_10)]

MIN (2.2, 3)

= 2.2

$D_\Delta = D_1, D_2, D_6, D_3, D_7, D_8, D_4, D_5$

	D_Δ	D_9	D_{10}
D_Δ	0		
D_9	2.2	0	
D_{10}	2.2	1.4	0

Select New cluster :- D_9, D_{10}

Update Distance

MIN [(D_9, D_10), D_Δ)

MIN [(D_9, D_Δ), (D_10, D_Δ)]

MIN (2.2, 2.2)

= 2.2

	D_Δ	D_9, D_{10}
D_Δ	0	
D_9, D_{10}	2.2	0

Select New cluster :- D_Δ, D_9, D_{10}