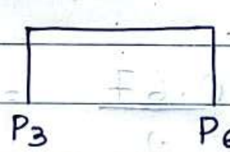
AVERAGE LINK CLUSTERING

Compute clusters for given distance Matrix, Use Average Link Clustering

P_1	0					
P_2	0.24	0				
P_3	0.22	0.15	0			
P_4	0.37	0.20	0.15	0		
P_5	0.34	0.14	0.28	0.29	0	
P_6	0.23	0.25	0.11	0.22	0.39	0
	P_1	P_2	P_3	P_4	P_5	P_6

Step 1 : Merge two points with smallest distance as a cluster.

Here point P_3, P_6 are closest as can be observed from distance matrix.



Recomputing the distance matrix

$$d((P_3, P_6), P_1) = \frac{1}{2}\left[d(P_1, P_3) + d(P_1, P_6)\right]$$

$$= \frac{1}{2}\left[0.22 + 0.23\right]$$

$$= \frac{0.45}{2}$$

$$= \underline{\underline{0.23}}$$

$$d((P_3, P_6), P_2) = \frac{1}{2}[d(P_3, P_2) + d(P_6, P_2)]$$

$$= \frac{1}{2}[0.15 + 0.25]$$

$$= \frac{0.4}{2}$$

$$= \underline{\underline{0.2}}$$

$$d((P_3, P_6), P_4) = \frac{1}{2}[d(P_3, P_4) + d(P_6, P_4)]$$

$$= \frac{1}{2}[0.15 + 0.22]$$

$$= \frac{0.37}{2} = \underline{\underline{0.19}}$$

$$d((P_3, P_6), P_5) = \frac{1}{2}[d(P_3, P_5), d(P_5, P_6)]$$

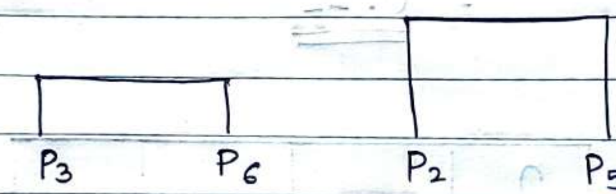
$$= \frac{1}{2}[0.28 + 0.39]$$

$$= \frac{0.67}{2} = \underline{\underline{0.34}}$$

New Distance Matrix

P_1	0				
P_2	0.24	0			
(P_3, P_6)	0.23	0.2	0		
P_4	0.37	0.20	0.19	0	
P_5	0.34	0.14	0.34	0.29	0
	P_1	P_2	(P_3, P_6)	P_4	P_5

Merging P_2, P_5



Recomputing distance Matrix

$$d[(P_2,P_5), P_1] = \frac{1}{2}[d(P_2,P_1) + d(P_1,P_5)]$$

$$= \frac{0.24 + 0.34}{2}$$

$$= \frac{0.58}{2} = \underline{\underline{0.29}}$$

$$d[(P_2,P_5),(P_3,P_6)] = \frac{1}{4}[d(P_2,P_3) + d(P_2,P_6) + d(P_5,P_3) + d(P_5,P_6)]$$

$$= \frac{1}{4}[0.15 + 0.25 + 0.28 + 0.39]$$

$$= \frac{1}{4}[1.07]$$

$$= \underline{\underline{0.27}}$$

$$d[(P_2,P_5), P_4] = \frac{1}{2}[d(P_2,P_4) + d(P_5,P_4)].$$

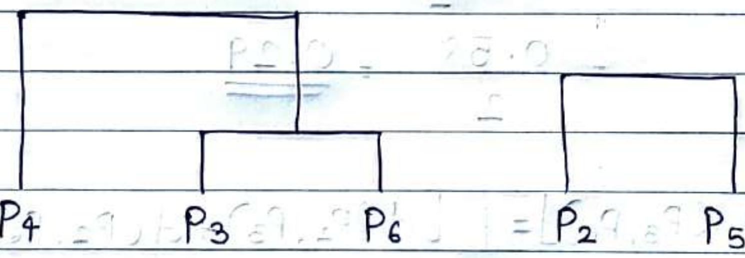
$$= \frac{1}{2}[0.14 + 0.29]$$

$$d[(P_2, P_5), P_4] = \frac{1}{2}[0.43]$$

$$= \underline{\underline{0.22}}$$

P_1	0			
(P_2, P_5)	0.29	0		
(P_3, P_6)	0.22	0.27	0	
P_4	0.37	0.22	0.15	0
	P_1	(P_2, P_5)	(P_3, P_6)	P_4

Merging P_4, (P_3, P_6), as they have minimum distance



$$d[(P_3, P_6, P_4), (P_2, P_5)] = \frac{1}{6}[d(P_3, P_2) + d(P_3, P_5) + d(P_6, P_2) + d(P_6, P_5) + d(P_4, P_2) + d(P_4, P_5)]$$

$$= \frac{1}{6}\left[\begin{array}{c} 0.15 + 0.28 + 0.25 + 0.39 \\ + 0.20 + 0.29 \end{array}\right]$$

$$= \frac{1}{6}[1.56]$$

$$= \underline{\underline{0.26}}$$

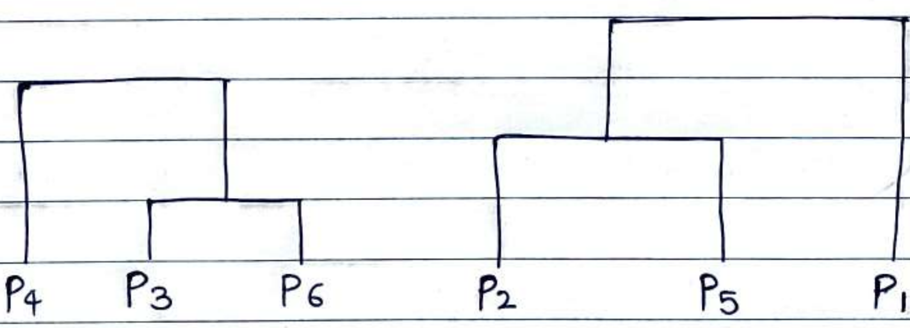
$$d[(P_3, P_6, P_4), P_1] = \frac{1}{3}[d(P_3, P_1) + d(P_6, P_1) + d(P_4, P_1)]$$

$$= \frac{1}{3}[0.22 + 0.23 + 0.37]$$

$$= \frac{1}{3}[0.82]$$

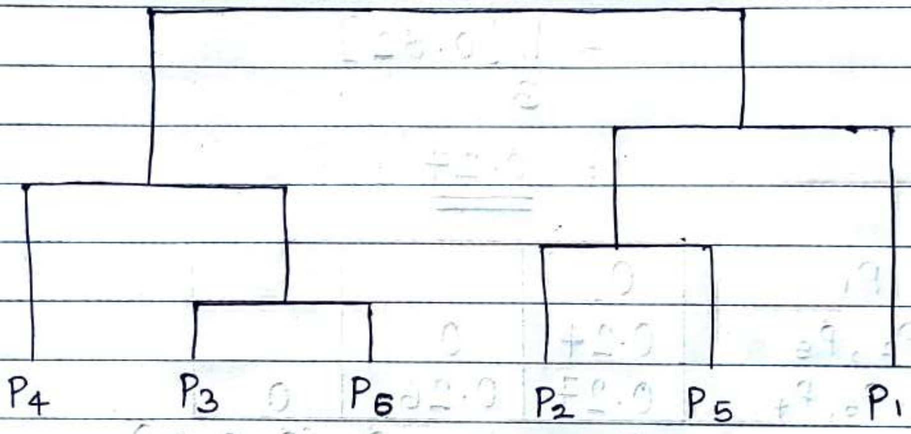
$$= \underline{\underline{0.27}}$$

P_1	0		
P_2, P_5	0.24	0	
P_3, P_6, P_4	0.27	0.26	0
	P_1	(P_2, P_5)	(P_3, P_6, P_4)



Merging (P_2, P_5) with P_1 as per the distance Matrix

$(P_1, (P_2, P_5))$	0	
(P_3, P_6, P_4)	0.26	0
	$(P_1, (P_2, P_5))$	(P_3, P_6, P_4)


P4
P3
P6
P2
P5
P1