**Agglomerative hierarchical clustering:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | B | C | D | E |
| A | 1 | 3 | 2 | 4 |
| B |  | 3 | 2 | 3 |
| C |  |  | 1 | 3 |
| D |  |  |  | 5 |

Using the above distance matrix table use simple link, and complete link methods to generate hierarchical clusters.

**Single Link:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | C | D | E |
| A,B | 3 | 2 | 3 |
| C |  | 1 | 3 |
| D |  |  | 5 |

|  |  |  |
| --- | --- | --- |
|  | C,D | E |
| A,B | 2 | 3 |
| C,D |  | 3 |

|  |  |
| --- | --- |
|  | E |
| ABCD | 3 |

**Complete Link:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | C | | D | | E |
| A,B | 3 | | 2 | | 4 |
| C |  | | 1 | | 3 |
| D |  | |  | | 5 |
|  | | C,D | | E | |
| A,B | | 3 | | 4 | |
| C,D | |  | | 5 | |

|  |  |
| --- | --- |
|  | E |
| ABCD | 5 |

**Average Link:**

|  |  |  |
| --- | --- | --- |
|  | C,D | E |
| A,B | 2.5 | 3.5 |
| C,D |  | 4 |

|  |  |
| --- | --- |
|  | E |
| ABCD | 3.75 |

**K-means:**

Use the K means algorithm and Euclidean distance to cluster the following 8 examples into 3 clusters:

A1 (2,10) A2 (2,5) A3 (8,4) A4 (5,8) A5 (7,5) A6 (6,4) A7 (1,2) A8 (4,9)

A1, A4, and A7 are initial seeds.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | D(Ai,A1) | D(Ai,A4) | D(Ai,A7) | New Assignment (Cluster) |
| A1 | 0 |  |  | C1 (A1) |
| A2 | 5 | 4.24 | 3.16 | C7 (A7) |
| A3 | 8.48 | 5 | 7.28 | C4 (A4) |
| A4 |  | 0 |  | C4 (A4) |
| A5 | 7.07 | 3.6 | 6.7 | C4 (A4) |
| A6 | 7.2 | 4.12 | 5.38 | C4 (A4) |
| A7 |  |  | 0 | C7 (A7) |
| A8 | 2.23 | 1.4 | 7.61 | C4 (A4) |

The previous table represents the results for one iteration only. Note that for the next iteration the new means are:

µ1 = A1, µ2 = (6,6), and µ3 = (1.5,3.5)