# MACHINE LEARNING

**Q1 to Q12 have only one correct answer. Choose the correct option to answer your question.**

1. Which of the following is an application of clustering?
   a. Biological network analysis
   b. Market trend prediction
   c. Topic modeling
   d. All of the above

Answer is b. Market trend prediction

2. On which data type, we cannot perform cluster analysis?
   a. Time series data
   b. Text data
   c. Multimedia data
   d. None

Answer is d. None of these

3. Netflix's movie recommendation system uses-
   a. Supervised learning
   b. Unsupervised learning
   c. Reinforcement learning and Unsupervised learning
   d. All of the above

Answer is a. Reinforcement learning and Unsupervised learning

4. The final output of Hierarchical clustering is-
   a. The number of cluster centroids
   b. The tree representing how close the data points are to each other
   c. A map defining the similar data points into individual groups
   d. All of the above

Answer is b. The tree representing how close the data points are to each other



5. Which of the step is not required for K-means clustering?
   a. A distance metric
   b. Initial number of clusters
   c. Initial guess as to cluster centroids
   d. None

Answer is d. None of these

6. Which is the following is wrong?
   a. k-means clustering is a vector quantization method
   b. k-means clustering tries to group n observations into k clusters
   c. k-nearest neighbour is same as k-means
   d. None

Answer is c. k-nearest neighbour is same as k-means

# MACHINE LEARNING

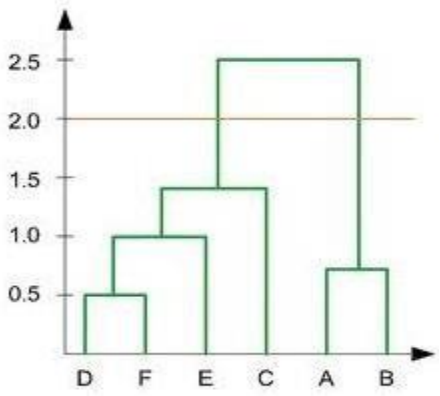
7. Which of the following metrics, do we have for finding dissimilarity between two clusters in hierarchical clustering?
   i. Single-link
   ii. Complete-link
   iii. Average-link
   Options:
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2 and 3

Answer is d. 1, 2 and 3 – All the metrics

8. Which of the following are true?
   i. Clustering analysis is negatively affected by multicollinearity of features
   ii. Clustering analysis is negatively affected by heteroscedasticity
   Options:
   a. 1 only
   b. 2 only
   c. 1 and 2
   d. None of them

Answer is a. 1 only - Clustering analysis is negatively affected by multicollinearity of features

9. In the figure above, if you draw a horizontal line on y-axis for y=2. What will be the number of clusters formed?




   a. 2
   b. 4
   c. 3
   d. 5

Answer is 2. two clusters will be formed

10. For which of the following tasks might clustering be a suitable approach?
   a. Given sales data from a large number of products in a supermarket, estimate future sales for each of these products.
   b. Given a database of information about your users, automatically group them into different market segments.
   c. Predicting whether stock price of a company will increase tomorrow.
   d. Given historical weather records, predict if tomorrow's weather will be sunny or rainy.

# MACHINE LEARNING

Answer is b. Given a database of information about your users, automatically group them into different market segments.

11. Given, six points with the following attributes:

| point | x coordinate | y coordinate |
|---|---|---|
| p1 | 0.4005 | 0.5306 |
| p2 | 0.2148 | 0.3854 |
| p3 | 0.3457 | 0.3156 |
| p4 | 0.2652 | 0.1875 |
| p5 | 0.0789 | 0.4139 |
| p6 | 0.4548 | 0.3022 |

**Table :** X-Y coordinates of six points.

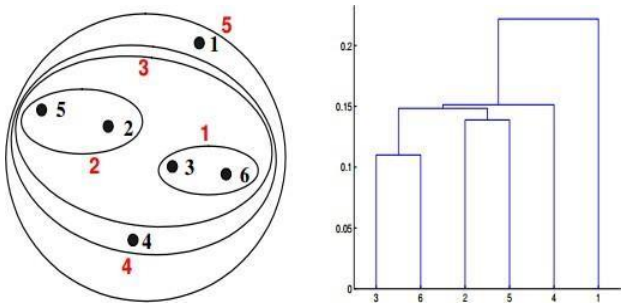
| | p1 | p2 | p3 | p4 | p5 | p6 |
|---|---|---|---|---|---|---|
| p1 | 0.0000 | 0.2357 | 0.2218 | 0.3688 | 0.3421 | 0.2347 |
| p2 | 0.2357 | 0.0000 | 0.1483 | 0.2042 | 0.1388 | 0.2540 |
| p3 | 0.2218 | 0.1483 | 0.0000 | 0.1513 | 0.2843 | 0.1100 |
| p4 | 0.3688 | 0.2042 | 0.1513 | 0.0000 | 0.2932 | 0.2216 |
| p5 | 0.3421 | 0.1388 | 0.2843 | 0.2932 | 0.0000 | 0.3921 |
| p6 | 0.2347 | 0.2540 | 0.1100 | 0.2216 | 0.3921 | 0.0000 |

**Table :** Distance Matrix for Six Points

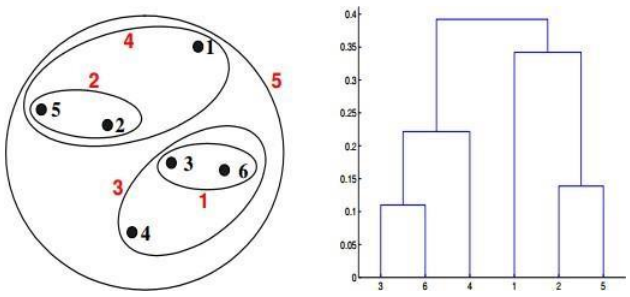
# MACHINE LEARNING

Which of the following clustering representations and dendrogram depicts the use of MIN or Single link proximity function in hierarchical clustering:

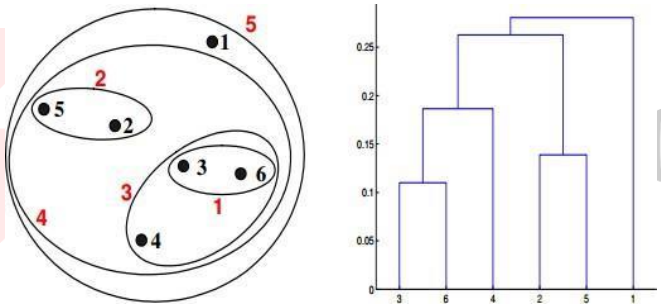
a.



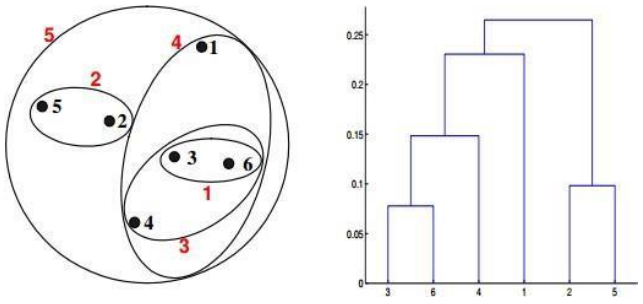

b.




c.




d.




Answer is a) - for the single link or MIN version of hierarchical clustering, the proximity of two clusters is defined to be the minimum of the distance between any two points in the different clusters.

# MACHINE LEARNING

12. Given, six points with the following attributes:

| point | x coordinate | y coordinate |
|---|---|---|
| p1 | 0.4005 | 0.5306 |
| p2 | 0.2148 | 0.3854 |
| p3 | 0.3457 | 0.3156 |
| p4 | 0.2652 | 0.1875 |
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**Table :** X-Y coordinates of six points.

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| p3 | 0.2218 | 0.1483 | 0.0000 | 0.1513 | 0.2843 | 0.1100 |
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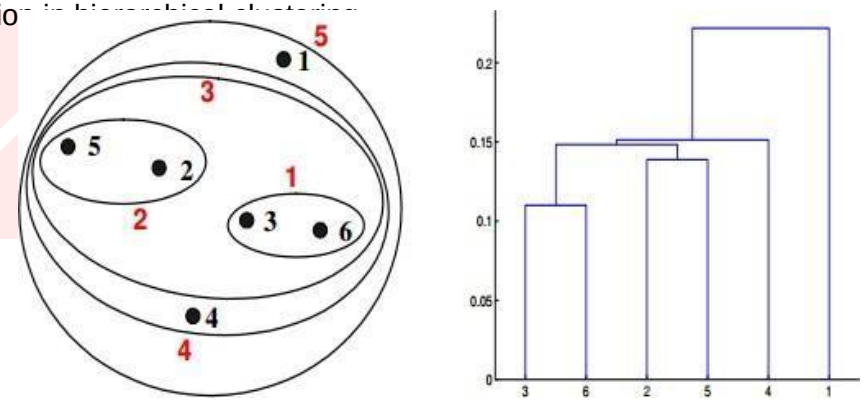
| p5 | 0.3421 | 0.1388 | 0.2843 | 0.2932 | 0.0000 | 0.3921 |
| p6 | 0.2347 | 0.2540 | 0.1100 | 0.2216 | 0.3921 | 0.0000 |

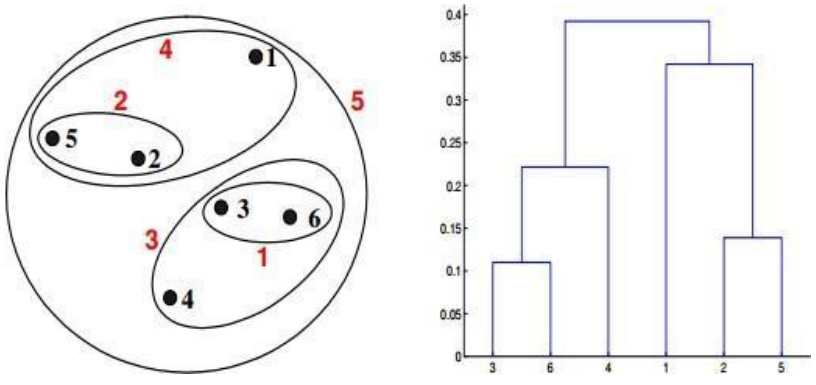
**Table :** Distance Matrix for Six Points

Which of the following clustering representations and dendrogram depicts the use of MAX or Complete link proximity functio[illegible] in hierarchical clustering

a.

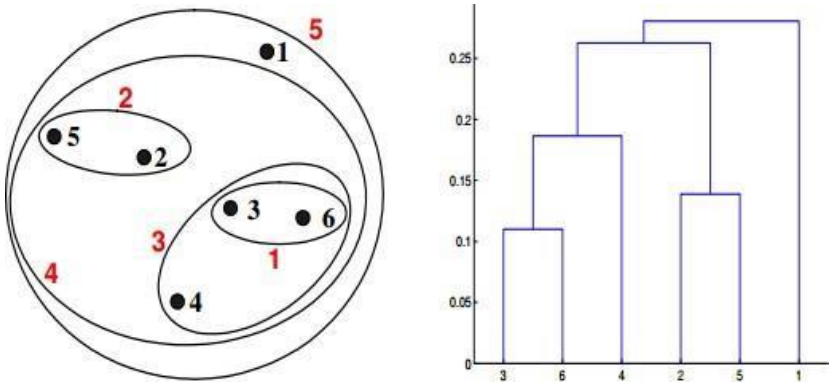



b.

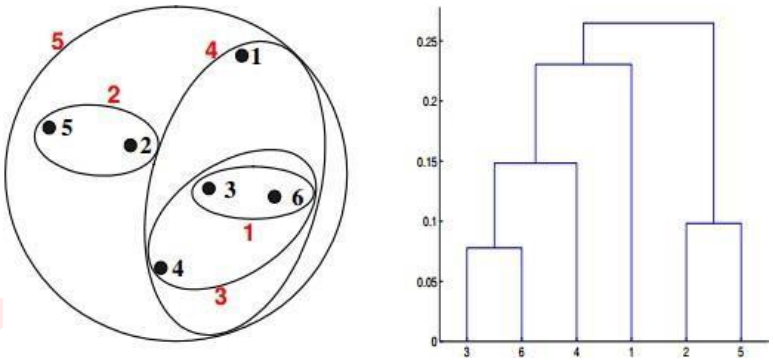


# MACHINE LEARNING

c.




d.




Answer is b) - for the single link or MAX version of hierarchical clustering, the proximity of two clusters is defined to be the maximum of the distance between any two points in the different clusters

**Q13 to Q14 are subjective answers type questions, Answers them in their own words briefly**

13. What is the importance of clustering?

Clustering helps in understanding the natural grouping in a dataset. Their purpose is to make sense to partition the data into some group of logical groupings. Clustering is considered to be a general task to solve the problem, which formulates optimization problems. We have seen different clustering methods that divide the data set depends on the requirements. Most of the research is based on K-means and hierarchical models.

14. How can I improve my clustering performance?

Applying unsupervised feature learning to input data, improves clustering performance. high clustering performance can be achieved by simply performing K-means clustering. K-means clustering algorithm can be significantly improved by using a better initialization technique, and by repeating the algorithm. When the data has overlapping clusters, k-means can improve the results of the initialization technique. When the data has well separated clusters, the performance of k-means depends completely on the goodness of the initialization.