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-D

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

   Answer- D

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-C

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-B

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-D

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-C

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

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c. 2 and 3

d. 1, 2 and 3

Answer-D

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

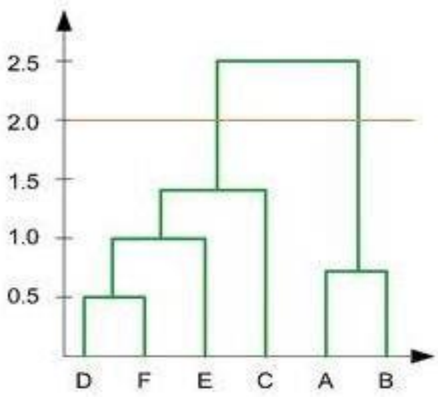
b. 2 only

c. 1 and 2

d. None of them

Answer-A

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-B

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.

Answer-B and C

11. Given, six points with the following attributes:

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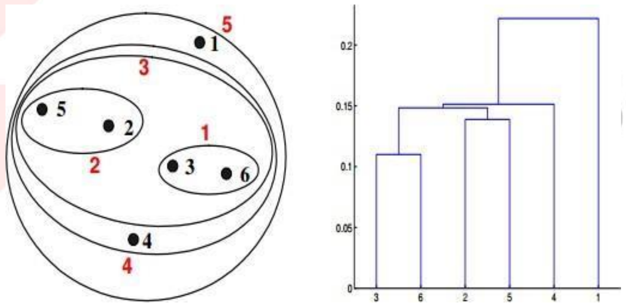
point	x coordinate	y coordinate
p1	0.4005	0.5306
p2	0.2148	0.3854
p3	0.3457	0.3156
p4	0.2652	0.1875
p5	0.0789	0.4139
p6	0.4548	0.3022

Table : X-Y coordinates of six points.

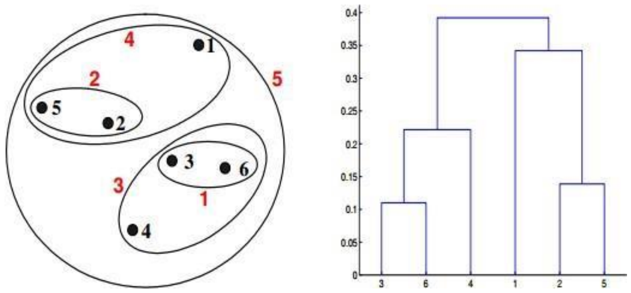
	p1	p2	p3	p4	p5	p6
p1	0.0000	0.2357	0.2218	0.3688	0.3421	0.2347
p2	0.2357	0.0000	0.1483	0.2042	0.1388	0.2540
p3	0.2218	0.1483	0.0000	0.1513	0.2843	0.1100
p4	0.3688	0.2042	0.1513	0.0000	0.2932	0.2216
p5	0.3421	0.1388	0.2843	0.2932	0.0000	0.3921
p6	0.2347	0.2540	0.1100	0.2216	0.3921	0.0000

Table : Distance Matrix for Six Points

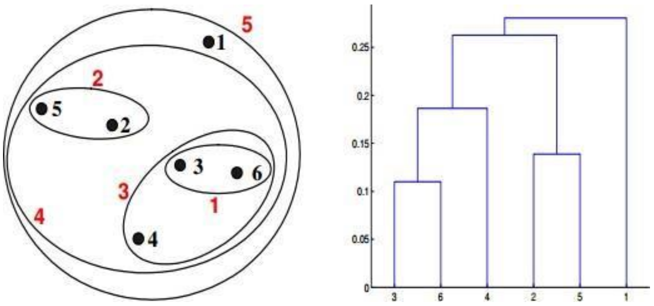
Which of the following clustering representations and dendrogram depicts the use of MIN or Single link proximity function in hierarchical clustering:



a.

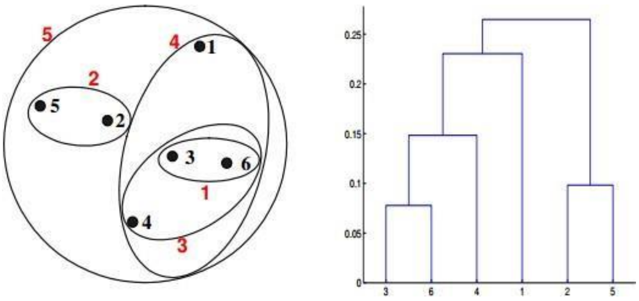


b.



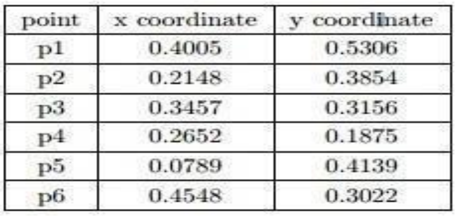
c.

d.



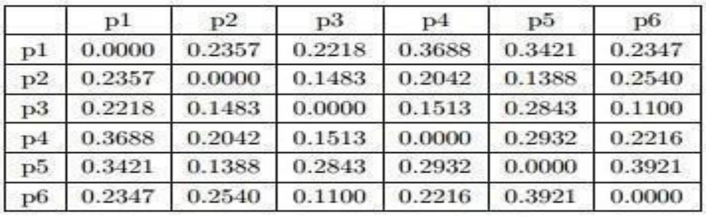
Answer-A

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
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

Which of the following clustering representations and dendrogram depicts the use of MAX or Complete link proximity function in hierarchical clustering.

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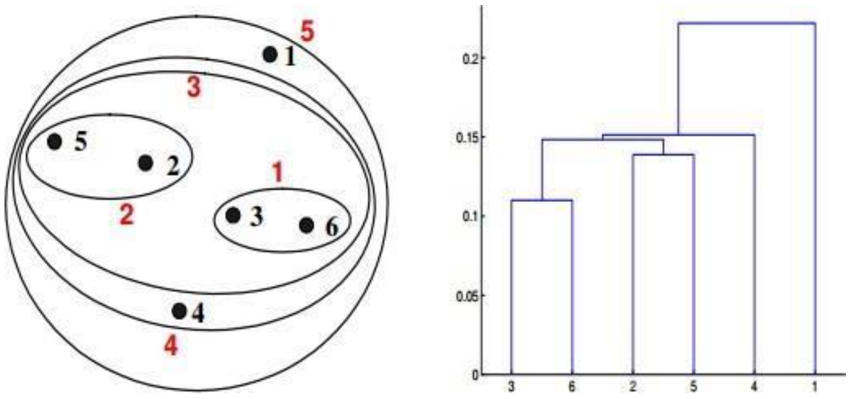
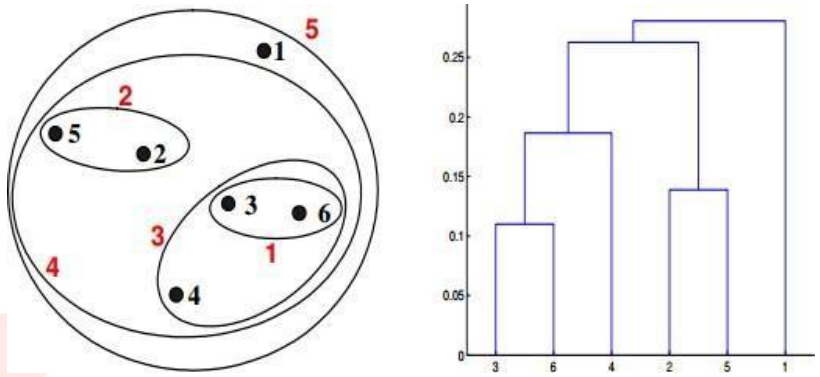
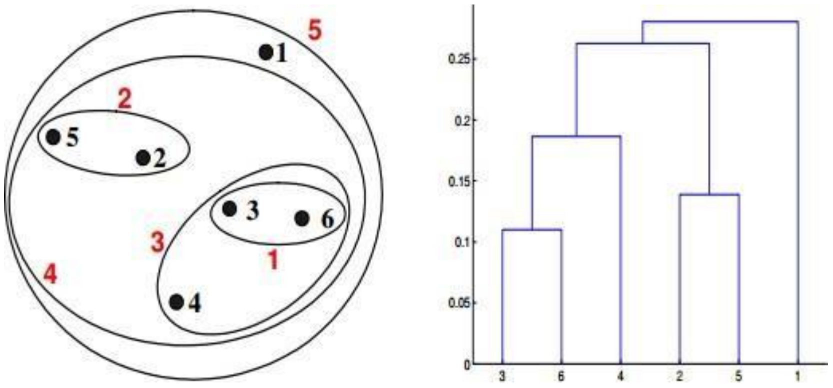


a.



b.



c.

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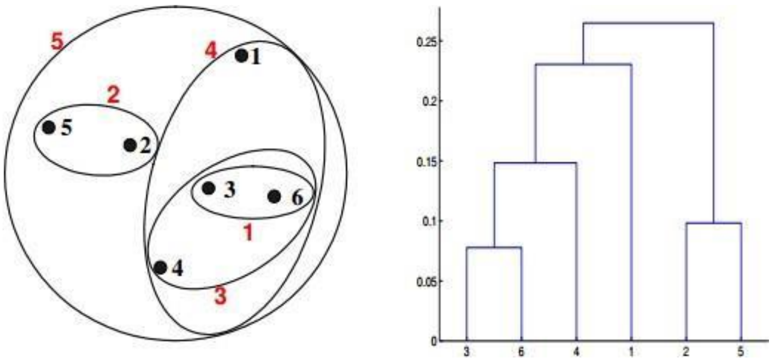
d.



Answer- B

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

13. What is the importance of clustering?

Answer-

Clustering is an unsupervised Machine Learning methodology in which dataset is divided into distinct groups or clusters having similar data or belonging to same group of data points.
Broadly clustering method can be divided into two groups.

1. **Hard clustering** – In which data points belong to only one group.
2. **Soft clustering** – In which datapoints can belong to other group also.

Clustering is important in data analysis and data mining application in which its main task is to do exploratory data mining and common technique for statistical data analysis which is used in many fields including Machine Learning, pattern recognition, image analysis, information retrieval and bioinformatics.

14. How can I improve my clustering performance?

Answer-

The most common ways of measuring the performance of clustering models are to either measure the distinctiveness or the similarity between the created groups. Given this, there are three common metrics to use, these are:

Silhouette Score: It is calculated using the mean intra- cluster distance and the mean nearest-cluster distance. This score is between -1 and 1, where the higher the score the more well-defined and distinct clusters are.

Calinski-Harabaz Index: It is calculated using the between- cluster dispersion and within-cluster dispersion in order to measure the distinctiveness between groups. This score has no bound, meaning that there is no 'acceptable' or 'good' value.

Davies-Bouldin Index: It is the average similarity of each cluster with its most similar cluster. This score measures the similarity of your clusters, meaning that the lower the score the better separation there is between your clusters.
So, to improve the performance of clustering methods, we need to use metrics which have an upper and lower bound. The most commonly used metric for measuring the performance of a clustering algorithm is the Silhouette Score and it can therefore be used for comparison as it's bounded between -1 and 1