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

Ans: d. All of the above

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

Ans: d. None

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

Ans: c. 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

Ans: 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

Ans: d. None

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

Ans: c. k-nearest neighbour is same as k-means

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:

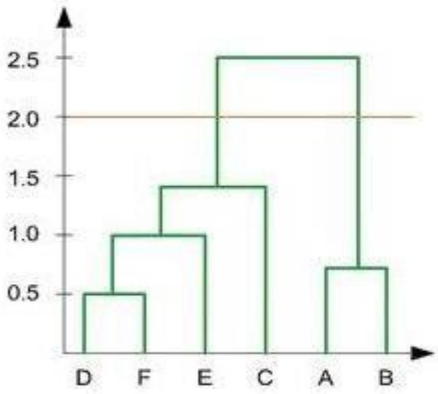
a. 1 and 2
b. 1 and 3
c. 2 and 3
d. 1, 2 and 3

Ans: d. 1, 2 and 3

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

Ans: a. 1 only

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

Ans: a. 2

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.

11. Given, six points with the following attributes:

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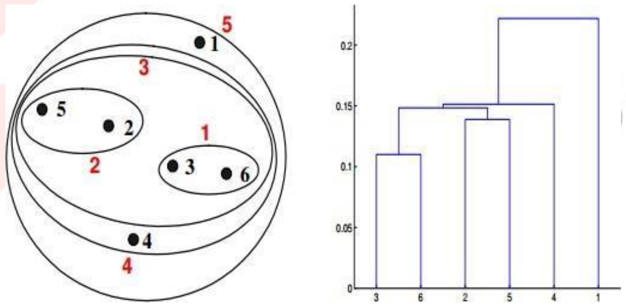
point	x coordinate	y coordinate
p1	0.4005	0.5306
p2	0.2148	0.3854
p3	0.3457	0.3156
p4	0.2652	0.1875
p5	0.0789	0.4139
p6	0.4548	0.3022

Table : X-Y coordinates of six points.

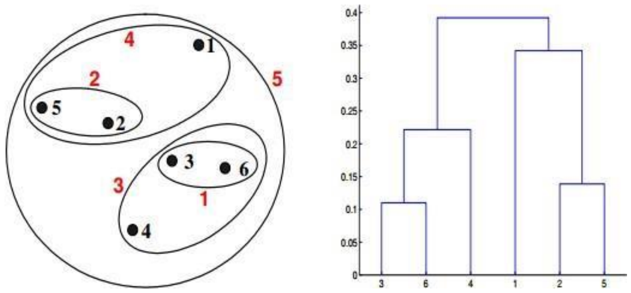
	p1	p2	p3	p4	p5	p6
p1	0.0000	0.2357	0.2218	0.3688	0.3421	0.2347
p2	0.2357	0.0000	0.1483	0.2042	0.1388	0.2540
p3	0.2218	0.1483	0.0000	0.1513	0.2843	0.1100
p4	0.3688	0.2042	0.1513	0.0000	0.2932	0.2216
p5	0.3421	0.1388	0.2843	0.2932	0.0000	0.3921
p6	0.2347	0.2540	0.1100	0.2216	0.3921	0.0000

Table : Distance Matrix for Six Points

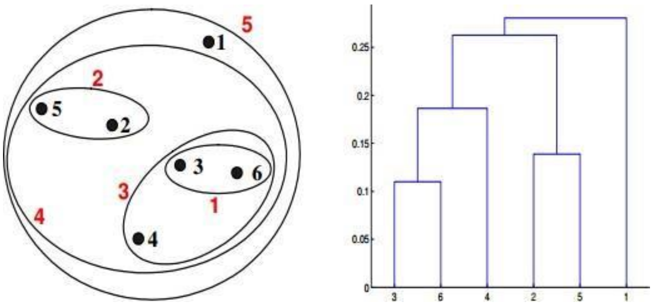
Which of the following clustering representations and dendrogram depicts the use of MIN or Single link proximity function in hierarchical clustering:



a.

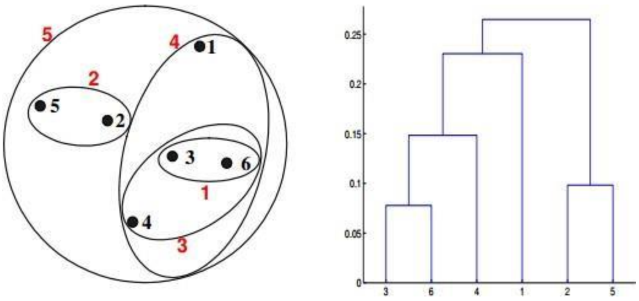


b.



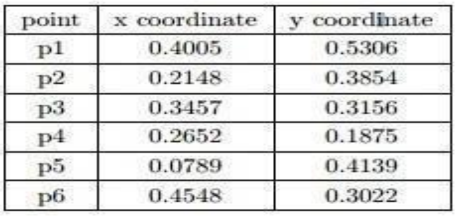
c.

d.



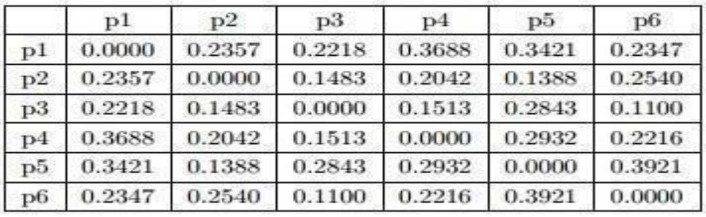
Ans: a

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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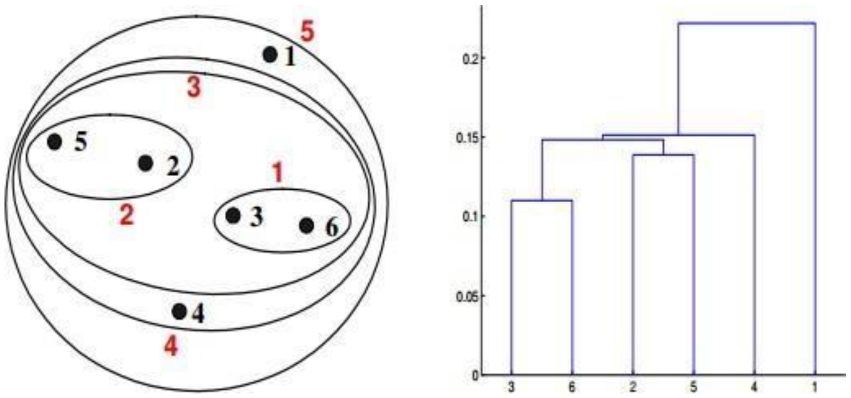
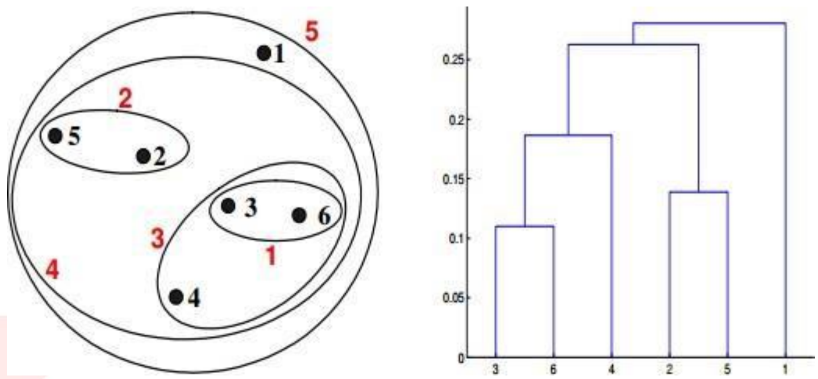
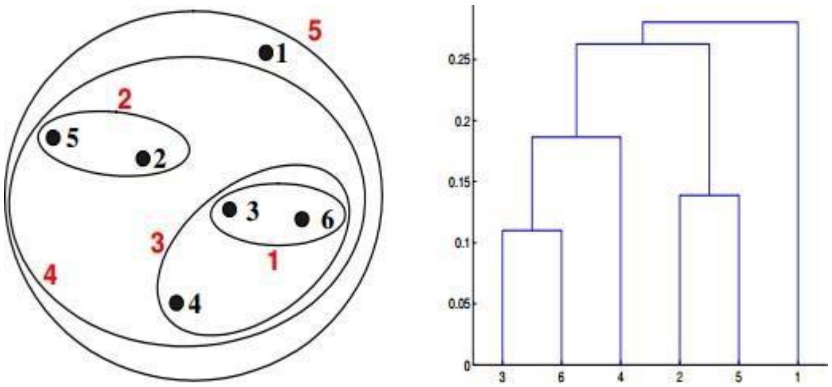
a.



b.



c.



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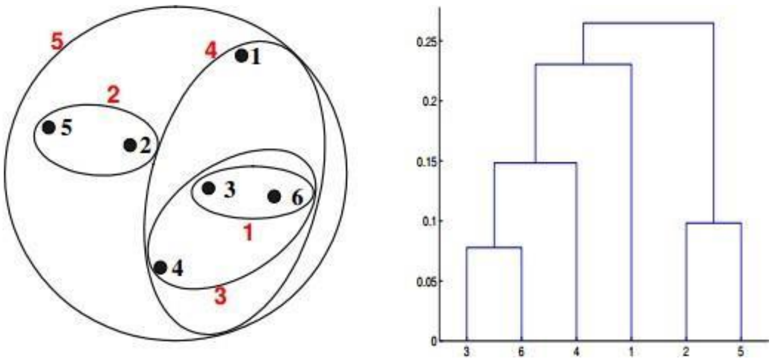
d.



Ans: b

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

13. What is the importance of clustering?

Ans: **Importance of Clustering**

1. Having clustering methods helps in restarting the local search procedure and remove the inefficiency. In addition, clustering helps to determine the internal structure of the data.
2. This clustering analysis has been used for model analysis, vector region of attraction.
3. 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.
4. Clustering quality depends on the methods and the identification of hidden patterns.
5. They play a wide role in applications like marketing economic research and weblogs to identify similarity measures, Image processing, and spatial research.
6. They are used in outlier detections to detect credit card fraudulence.

Clustering is considered to be a general task to solve the problem, which formulates optimization problems. It plays key importance in the field of data mining and data analysis. There are different clustering methods that divide the data set depends on the requirements. Most of the research is based on traditional techniques like K-means and hierarchical models. Cluster areas are applied in high dimensional states, which form a future scope of researchers.

14. How can I improve my clustering performance?

- K-means clustering algorithm can be significantly improved by using a better initialization technique, and by repeating (re-starting) 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.
- Initialization using simple furthest point heuristic (Maxmin) reduces the clustering error of k-means from 15% to 6%, on average.

For performance enhancement of conceptual clustering algorithm, feature selection and extraction methods, namely QR, PCA, and ICA can be used. The removal of linear dependency of features improves the numerical stability of the algorithm. Reduction of feature space also considerably improves not only the performance of the algorithm but also the clustering accuracy.