MACHINE LEARNING ASSIGNMENT – 3

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

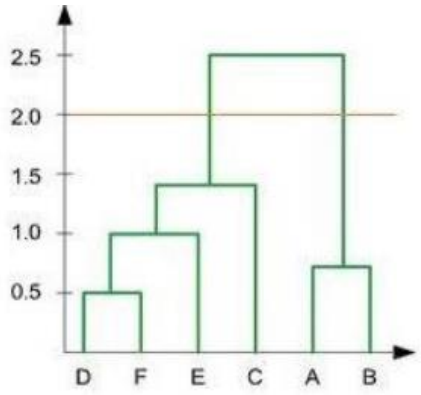
b. 2 only

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.

Ans→

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

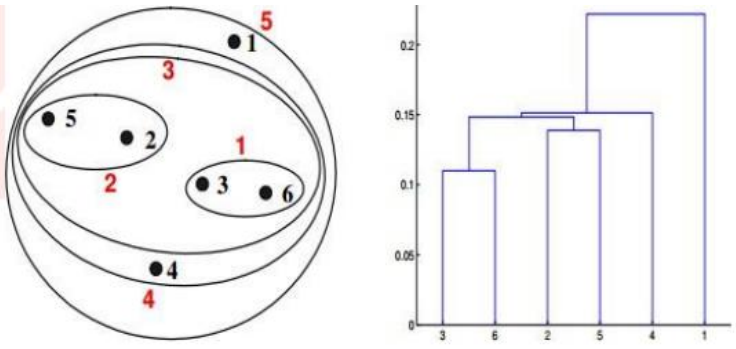
Table : X-Y coordinates of six points.

	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

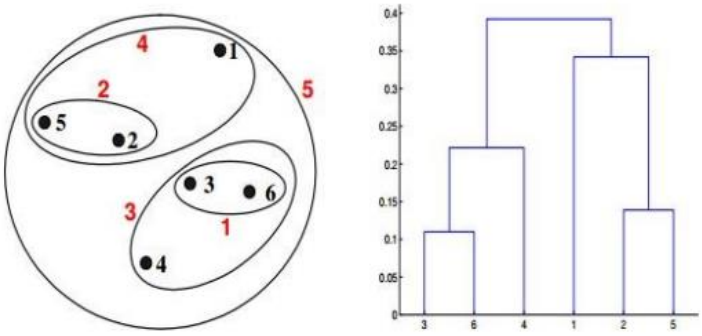
Table : Distance Matrix for Six Points

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

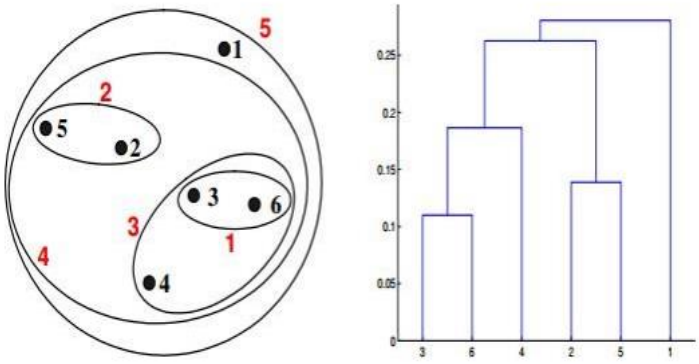
a.



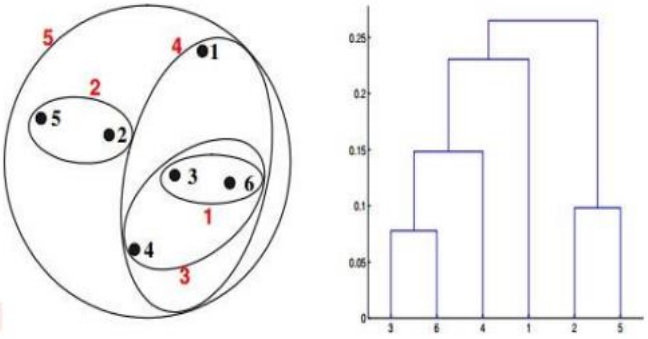
b.



c.



d.



Ans→ D

Ward method is a centroid method. Centroid method calculates the proximity between two clusters by calculating the distance between the centroids of clusters. For Ward's method, the proximity between two clusters is defined as the increase in the squared error that results when two clusters are merged. The results of applying Ward's method to the sample data set of six points. The resulting clustering is somewhat different from those produced by MIN, MAX, and group average.

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

13. What is the importance of clustering?

Ans→ Clustering is important in **data analysis and data mining applications** [1]. It is the task of grouping a set of objects so that objects in the same group are more similar to each other than to those in other groups. A good clustering algorithm is able to identity clusters irrespective of their shapes.

1. **Identification:** Know what you are dealing with. Identifying is like putting all the pieces on the table, mapping out the situation, and sorting them using patterns.

2. **Analysis:** Analyze these patterns to make your clusters more focused and accurate.

3. **Strategy:** Create differentiated strategies for each of the clusters, with specific objectives, actions, and goals.

14. How can I improve my clustering performance?

Ans→ k-means is a very simple and ubiquitous clustering algorithm. But quite often it does not work on your problem, for example because the initialization is bad. I ran into a similar problem recently, where I applied k-means to a smaller number of files in my data sets and everything worked fine, but when I ran it on many more samples it just wasn't reliably getting good results.

Fortunately, there is an improved initialization method, k-means++, which can help to alleviate this problem. In this article we will cover the following:

Why initialization is so important for k-means

An intuitive description into the k-means++ algorithm

Implementation of k-means++ in R

A common, but wrong variant of k-means++