**Section – A(1 marks 20 questions)**

**1. What is K-means clustering primarily used for?**

a) Classification b) Regression c) Unsupervised learning d) Supervised learning

2. **What does 'K' represent in K-means clustering?**

a) Number of clusters b) Number of dimensions c) Number of samples d) Number of features

3. **Which of the following is a limitation of K-means clustering?**

a) Sensitive to outliers b) Suitable for non-linear data

c) Robust to high-dimensional data d) Suitable for small datasets

4. **How is the initial position of centroids determined in K-means clustering?**

a) Randomly b) Based on the mean of all data points

c) Based on the median of all data points d) Based on the mode of all data points

**5. Which method can be used to determine the optimal number of clusters in K-means?**

a) Elbow method b) Silhouette coefficient c) Both a and b d) None of the above

**6. What is the basic building block of an Artificial Neural Network?**

a) Neuron b) Weight c) Activation function d) Bias

**7. Which activation function is commonly used in the output layer for binary classification problems?**

a) ReLU b) Sigmoid c) Tanh d) Softmax

8. **What is backpropagation used for in training neural networks?**

a) To calculate the error b) To update weights

c) To initialize the network d) To define the architecture

9. **What is overfitting in the context of neural networks?**

a) Model performs well on training data but poorly on unseen data

b) Model performs poorly on training data and unseen data

c) Model generalizes well to unseen data d) Model doesn't generalize well to unseen data

10. **Which of the following is a regularization technique used to prevent overfitting in neural networks?**

a) Dropout b) Batch normalization c) Learning rate decay d) All of the above

11. **What is the primary objective of PCA?**

a) To maximize variance b) To minimize variance

c) To maximize bias d) To minimize bias

12. **PCA is primarily used for which purpose?**

a) Dimensionality reduction b) Feature extraction c) Both a and b d) None of the above

**13. What does the principal component represent in PCA?**

a) The original feature space b) The new feature space

c) The variance of the data d) The mean of the data

**14. Which of the following is true about eigenvalues in PCA?**

a) They represent the direction of maximum variance

b) They represent the variance explained by each principal component

c) They are used to scale the data d) They are computed using the mean of the data

15. **What is the effect of increasing the number of principal components in PCA?**

a) Decreases explained variance b) Increases explained variance

c) No effect on explained variance d) Increases bias

**16. Which algorithm is used for clustering unlabelled data?**

a) K-means b) Linear Regression c) Decision Trees d) Random Forest

17. **In ANN, what does the input layer do?**

a) Processes the input data b) Stores the learned information

c) Transforms the data non-linearly d) None of the above

**18. What is the primary purpose of dimensionality reduction techniques like PCA?**

a) To increase computational complexity

b) To decrease the interpretability of the data

c) To decrease the number of features while retaining most of the information

d) To increase overfitting

**19. In K-means clustering, how are clusters formed?**

a) Based on random initialization

b) Based on minimizing intra-cluster variance

c) Based on maximizing inter-cluster variance

d) Based on minimizing inter-cluster distance

**20. Which of the following is a disadvantage of using a neural network?**

a) Can model complex patterns b) Prone to overfitting

c) Requires minimal computational resources d) Easily interpretable

**Section - B (2 marks 15 questions)**

**21. Which of the following is NOT a distance metric used in K-means clustering?**

a) Euclidean distance b) Manhattan distance c) Mahalanobis distance d) Pearson correlation

22. **What is the purpose of the activation function in a neural network?**

a) To introduce non-linearity b) To normalize the input data

c) To regularize the network d) To initialize the weights

23. **Which of the following is NOT a step in PCA?**

a) Standardization b) Calculation of covariance matrix

c) Calculation of eigenvalues and eigenvectors d) Calculation of centroids

24. **What happens to the variance explained by principal components as we move from the first principal component to subsequent ones?**

a) Increases b) Decreases c) Remains constant d) Randomly fluctuates

**25. What is the role of centroids in K-means clustering?**

a) Represent the mean of all data points in a cluster

b) Represent the variance of all data points in a cluster

c) Represent the distance between clusters

d) None of the above

**26. Which of the following is true about local optima in K-means clustering?**

a) K-means is guaranteed to converge to the global optimum

b) K-means is sensitive to initial centroids and may converge to local optima

c) K-means always converges to the nearest centroid

d) K-means converges faster when initialized randomly

**27. In neural networks, what is the purpose of the learning rate?**

a) To control the convergence speed b) To control the batch size

c) To initialize the weights d) None of the above

**28. Which of the following is a criterion to select the number of principal components to retain in PCA?**

a) Variance explained b) Correlation coefficient c) Learning rate d) Activation function

**29. What is the effect of increasing the number of neurons in a neural network?**

a) Decreases model complexity b) Increases model capacity

c) Decreases training time d) None of the above

**30. What is the main challenge in determining the optimal number of clusters in K-means?**

a) Lack of computational resources b) Lack of labeled data

c) Subjectivity in interpretation d) None of the above

**31. What is the objective of K-means clustering?**

a) Minimize intra-cluster variance b) Maximize inter-cluster distance

c) Minimize inter-cluster variance d) Maximize intra-cluster distance

**32. Which of the following statements about PCA is true?**

a) It increases the dimensionality of the data.

b) It is a supervised learning technique.

c) It requires labeled data for training.

d) It finds the orthogonal axes with maximum variance in the data.

**33. In ANN training, what does the term 'epoch' refer to?**

a) A single forward pass and backward pass of all training examples

b) A single forward pass of a training example

c) The number of layers in the neural network

d) The learning rate of the neural network

**34. Which step is NOT involved in K-means clustering?**

a) Initialization of cluster centroids

b) Assignment of data points to the nearest centroid

c) Updating the centroids based on the mean of assigned data points

d) Calculating the covariance matrix

**35. What is the primary purpose of the 'activation function' in neural networks?**

a) To scale input features b) To introduce non-linearity

c) To regularize the weights d) To control the learning rate