

Enrollment No.....



Faculty of Engineering
End Sem (Odd) Examination Dec-2022
CS3EA04 Pattern Recognition

Programme: B.Tech.

Branch/Specialisation: CSE

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Which of the following is necessary to know to use Bayes' Theorem to calculate the $P(A/B)$: **1**
 (a) $P(A)$ and $P(B)$ (b) $P(B)$ and $P(B/A)$
 (c) $P(A)$, $P(B)$, and $P(B/A)$ (d) $P(A)$ and $P(B/A)$
- ii. A _____ is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. **1**
 (a) Decision tree (b) Graphs
 (c) Trees (d) Neural networks
- iii. What is meant by notation $p(w|x)$, where x is feature and w_i is state of nature: **1**
 (a) Likely-hood (b) Prior probability
 (c) Posterior probability (d) None of these
- iv. Which allows for a simple and matrix implementation of all the basic algorithm? **1**
 (a) HMM (b) Restricted structure of HMM
 (c) Temporary model (d) Reality model
- v. When performing regression or classification, which of the following is the correct way to pre-process the data? **1**
 (a) Normalize the data \rightarrow PCA \rightarrow training
 (b) PCA \rightarrow normalize PCA output \rightarrow training
 (c) Normalize the data \rightarrow PCA \rightarrow normalize PCA output \rightarrow training
 (d) None of these

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[2]

- vi. The Euclidean distance between two a set of numerical attributes is called as? **1**
 (a) Closeness (b) Validation data
 (c) Error rate (d) None of these
- vii. This clustering algorithm merges and splits nodes to help modify no optimal partitions. **1**
 (a) Agglomerative clustering (b) Expectation maximization
 (c) Conceptual clustering (d) K-Means clustering
- viii. Which of the following is finally produced by Hierarchical Clustering? **1**
 (a) Final estimate of cluster centroids
 (b) Tree showing how close things are to each other
 (c) Assignment of each point to clusters
 (d) All of these
- ix. Find all faces in an image regardless of their position, scale, in plane rotation, pose, illumination, facial expressions, occlusions is called- **1**
 (a) Face detection (b) Face recognition
 (c) Face identification (d) Face verification
- x. In SVM, the dimension of the hyperplane depends upon which one? **1**
 (a) The number of features
 (b) The number of samples
 (c) The number of target variables
 (d) All of these
- Q.2 i. Explain the designing cycle of pattern recognition with the help of appropriate diagram. **4**
 ii. State and prove that a bayes classifier is equivalent to a minimum distance classifier, assuming that the feature vector is Gaussian. **6**
- OR iii. Explain the concept of a decision tree with the help of an example. Which measure is used as an attribute selection measure for different tree models? **6**

[3]

- Q.3 i. Define the general principal of bayesian method of estimation. Why is parameter estimation important? **3**
 ii. Explain hidden markov model (HMM) decoding algorithm with the help of example and its role in the classifier design. **7**
- OR iii. Explain maximum likelihood estimation with suitable example when the distribution is Gaussian. **7**
- Q.4 i. What is meant by the curse of dimensionality? **2**
 ii. How the K-nearest neighbour method works? Explain with KNN estimation and KNN rule with the help of suitable example. **8**
- OR iii. Explain the principal component analysis for dimensionality reduction with example. **8**
- Q.5 i. What is clustering? Define the criterion functions used in clustering. **3**
 ii. What do you mean by hierarchical clustering? Differentiate between agglomerative and divisive clustering techniques. **7**
- OR iii. What is K means Clustering? State and explain the steps of K-means clustering algorithm with suitable example. **7**
- Q.6 Attempt any two:
 i. Formulate SVM as an optimization problem. How support vector machines can be used for classification of data which are not linearly separable? **5**
 ii. What is OCR? Explain how the process of optical character recognition is done. **5**
 iii. What is meant by image analysis? Explain the steps of image analysis. **5**

Marking Scheme
CS3EA04 Pattern Recognition

1	i.	Which of the following is necessary to know to use Bayes' Theorem to calculate the P(A/B): (c) P(A), P(B), and P(B/A)	1
	ii.	A _____ is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility. (a) Decision tree.	1
	iii.	What is meant by notation $p(w_i x)$, where x is feature and w_i is state of nature: (b) Prior Probability.	1
	iv.	Which allows for a simple and matrix implementation of all the basic algorithm? (b) Restricted structure of HMM.	1
	v.	When performing regression or classification, which of the following is the correct way to pre-process the data? (a) Normalize the data → PCA → training.	1
	vi.	The Euclidean distance between two a set of numerical attributes is called as? (a) Closeness.	1
	vii.	This clustering algorithm merges and splits nodes to help modify no optimal partitions. (d) K-Means clustering.	1
	viii.	Which of the following is finally produced by Hierarchical Clustering? (b) Tree showing how close things are to each other.	
	ix.	Find all faces in an image regardless of their position, scale, in plane rotation, pose, illumination, facial expressions, occlusions is called- (a) Face detection	1

	x.	In SVM, the dimension of the hyperplane depends upon which one? (a) The number of features	1
Q.2	i.	Explain the designing cycle of pattern recognition with the help of appropriate diagram. Designing cycle/ diagram. -1 Marks Description for each phases -3 Marks	4
OR	ii.	State and Prove that a Bayes classifier is equivalent to a minimum distance classifier, assuming that the feature vector is Gaussian. Bayes Theorem -2 Marks Minimum distance classifier -2 Marks Equivalent When feature vector is Gaussian -2 Marks	6
	iii.	Explain the concept of a decision tree with the help of an example. Which measure is used as an attribute selection measure for different tree models? Concept of a decision tree -2 Marks Example with Diagram - 3 Marks Which measure is used - 1 Marks	6
Q.3	i.	Define the general principal of Bayesian method of estimation. Why is parameter estimation important? Define principal of Bayesian method -2 Marks Why is parameter estimation important - 1 Marks	3
OR	ii.	Explain Hidden Markov model (HMM) decoding algorithm with the help of example and its role in the classifier design. Explain HMM algorithm - 3 Marks Example - 3 Marks Role in the classifier design - 1 Marks	7
	iii.	Explain maximum likelihood estimation with suitable example, when the distribution is Gaussian. Explain maximum likelihood estimation - 4 Marks Example - 3 Marks	7

Q.4	i.	What is meant by the curse of dimensionality?	2
		What is curse of dimensionality? -2 Marks	
OR	ii.	How the K-nearest neighbour method works? Explain with KNN estimation and KNN rule with the help of suitable example.	8
		KNN method Works - 2 Marks KNN estimation - 2 Marks KNN rule - 2 Marks Example. - 2 Marks	
	iii.	Explain the principal component analysis for dimensionality reduction with example. Explain PCA -4 Marks Example -4 Marks	8
Q.5	i.	What is clustering? Define the criterion functions used in clustering.	3
		What is clustering? - 1 Marks Define the criterion functions -2 Marks	
OR	ii.	What do you mean by hierarchical clustering? Differentiate between agglomerative and divisive clustering techniques. Hierarchical clustering - 2 Marks Differentiation - 4Marks	7
	iii.	What is K means Clustering? State and explain the steps of K-means clustering algorithm with suitable example.	7
		Definition - 2 Marks Steps of K-means clustering - 2 Marks Example - 3 Marks	
Q.6		Attempt any two:	
	i.	Formulate SVM as an optimization problem. How support vector machines can be used for classification of data which are not linearly separable?	5
		Definition – 2 Marks How support vector machines can be us -3Marks	

	ii.	What is OCR? Explain how the process of optical character recognition is done.	5
		What is OCR? - 2 Marks Process of OCR -3Marks	
	iii.	What is meant by image analysis? Explain the steps of image analysis.	5
		Meant by image analysis? - 1 Marks Diagram - 1 Marks Explanation of steps -3 Marks	
