

Roll No.

--	--	--	--	--	--	--	--	--	--	--

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B. Tech (Full Time) - END SEMESTER EXAMINATIONS, NOV/DEC 2021

INFORMATION TECHNOLOGY
VTH SEMESTER
IT5012 & PATTERN RECOGNITION

(Regulation 2019)

Time: 3hrs

Max.Marks: 100

CO 1	Implement basic pattern classifier algorithms.
CO 2	Have knowledge about the working principle of unsupervised algorithms
CO 3	Have knowledge about functionality of classifiers.
CO 4	Perceive the recent advancement in pattern recognition.
CO 5	Apply SVM and HMM algorithms for real time applications

BL – Bloom’s Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Explain the design principle of a pattern recognition system	2	1	1
2	Compare supervised and unsupervised learning techniques	2	1	2
3	Define Bayes theorem?	2	3	1
4	What is meant by the curse of dimensionality?	2	1	1
5	Give criterion function of clustering?	2	3	2
6	Define HMM and list the three problems addressed by it?	2	2	2
7	Define kernel in SVM model?	2	5	1
8	Let: $A = 0.7/1 + 0.8/2 + 2/5$, and $B = 0.75/2 + 0.95/3 + 0.2/4$. Compute $A \cup B$ and $A \cap B$	2	5	1
9	Let: $A = 0.2/1 + 0.5/2 + 0.7/3 + 1/4 + 0.8/5 + 0.4/6 + 0.2/7$. Compute the α -level set of A for $\alpha = 0.5$ AND $\alpha = 0.8$	2	4	3
10	What is perceptron learning rule?	2	4	1

PART- B (5 x 13 = 65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL																																								
11 (a) (i)	Explain Fisher's Linear Discriminant based algorithm?	7	1	1																																								
(ii)	<p>Consider the following dataset which is used for predicting a students performance using naive bayes algorithm</p> <table border="1"> <thead> <tr> <th>CGPA</th><th>Interactiveness</th><th>Practical Knowledge</th><th>Communication Skills</th><th>Job offer</th></tr> </thead> <tbody> <tr> <td>≥ 9</td><td>yes</td><td>Very good</td><td>Good</td><td>Yes</td></tr> <tr> <td>≥ 7</td><td>yes</td><td>good</td><td>Moderate</td><td>yes</td></tr> <tr> <td>≥ 9</td><td>no</td><td>average</td><td>Poor</td><td>no</td></tr> <tr> <td>≥ 8</td><td>no</td><td>average</td><td>Good</td><td>yes</td></tr> <tr> <td>≥ 7</td><td>yes</td><td>good</td><td>Poor</td><td>no</td></tr> <tr> <td>≥ 9</td><td>yes</td><td>average</td><td>Good</td><td>yes</td></tr> <tr> <td>≥ 9</td><td>no</td><td>Very good</td><td>Moderate</td><td>yes</td></tr> </tbody> </table> <p>Given a test data to be (CGPA≥ 9, Interactiveness=yes, Practical Knowledge =Average, Communication Skills=Good) Predict whether a student gets a job offer or not in his final year of the course?</p>	CGPA	Interactiveness	Practical Knowledge	Communication Skills	Job offer	≥ 9	yes	Very good	Good	Yes	≥ 7	yes	good	Moderate	yes	≥ 9	no	average	Poor	no	≥ 8	no	average	Good	yes	≥ 7	yes	good	Poor	no	≥ 9	yes	average	Good	yes	≥ 9	no	Very good	Moderate	yes	6	1	3
CGPA	Interactiveness	Practical Knowledge	Communication Skills	Job offer																																								
≥ 9	yes	Very good	Good	Yes																																								
≥ 7	yes	good	Moderate	yes																																								
≥ 9	no	average	Poor	no																																								
≥ 8	no	average	Good	yes																																								
≥ 7	yes	good	Poor	no																																								
≥ 9	yes	average	Good	yes																																								
≥ 9	no	Very good	Moderate	yes																																								
OR																																												
11 (b) (i)	Explain the general principle of the maximum likelihood estimation for Gaussian distribution of the features	7	1	1																																								
(ii)	<p>A) Calculate P(Wet grass) B) Calculate P(Cloudy) if the grass is not wet</p>	6	1	3																																								
12 (a) (i)	1) Apply divisive algorithm of clustering to cluster the following dataset and also show the dendrogram. { (3,4),(5,5),(6,3),(6,9),(5,9),(7,7),(8,4),(9,6)}	13	2	3																																								
OR																																												
12 (b) (i)	Given 7 two dimensional patterns A=(2,2) , B=(4,4),C=(6,6), D=(0,4), E=(4,0), F=(5,5), G=(9,9). Using k-means algorithm obtain 3 clusters	13	2	3																																								
13 (a) (i)	Explain the steps for finding the maximum clique / community in a given graph? Give example	13	3	3																																								
OR																																												
13 (b) (i)	<p>Find KL transformation matrix for the following image data</p> $\begin{bmatrix} 0000 \\ 0110 \\ 0110 \end{bmatrix}$	13	3	3																																								

14 (a) (i)	<p>Consider the hidden state Markov model which shows the behavior of student going to school with transition and emission probability.</p> <p>Compute hidden state sequence for the given observation sequence '313'</p>	13	5	3															
OR																			
14 (b) (i)	<p>How support vector machines can be used for classification of following data which are not linearly separable?</p> <table><tr><td>X1</td><td>X2</td><td>Y</td></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>-1</td></tr><tr><td>1</td><td>0</td><td>-1</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>	X1	X2	Y	0	0	1	0	1	-1	1	0	-1	1	1	1	13	5	3
X1	X2	Y																	
0	0	1																	
0	1	-1																	
1	0	-1																	
1	1	1																	
15 (a) (i)	<p>Classify the following data set using Fuzzy C-Means (1,2) (2,4)(3,6) (6,5) (8,4) (Note: no. of classes =2, fuzziness index=2 and criteria convergence=0.001 and no.of iteration=2)</p>	13	4	3															
OR																			
15 (b) (i)	<p>Consider the fuzzy rule R: if service is good then customer is satisfied. Related universes are service-rating = { a,b,c,d,e} and satisfaction-grade={1,2,3,4,5} where the service-rating a,b,c,d,e are in descending order and the satisfaction-grades 1,2,3,4,5 are in ascending order. The fuzzy sets good-service and satisfied are defined as follows</p> <p>good-service= $1.0/a + 0.8/b + 0.6/c + 0.4/d + 0.2/e$ satisfied = $0.2/1 + 0.4/2 + 0.6/3 + 0.8/4 + 1.0/5$ Find the relation matrix for this rule using a) Zadeh Interpretations</p>	7	4	3															
(ii)	Write a short notes on Back propagation?	6	4	3															

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Explain Baum-Welch algorithm to learn the parameters of HMM?	9	4	2
(ii)	Write a short notes on the following Binary Feature selection	6	3	2

