Hall Ticket Number:

Code No. : 16136 I

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. VI-Semester Main & Backlog Examinations, June-2022

Introduction to Machine Learning (OE-IV)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define Artificial Intelligence. List the sub-areas of AI.	2	1	1	1
2.	Differentiate between classification and regression problems. Give an example for each.	2	2	1	2
3.	Define entropy and information gain.	2	1	2	1
4.	Why kNN is often referred to as a lazy learning algorithm?	2	1	2	1
5.	What is the purpose of an activation function? Define sigmoid activation function.	2	1	3	1
6.	What is non-linearly separable problem? Give an example.	2	1	3	1
7.	What is class conditional independence?	2	1	4	1
8.	State and prove Bayes theorem.	2	1	4	1
9.	Define core, border, and noise points.	2	2	5	2
10.	What is clustering? List different types of clustering approaches.	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	Consider the following five training examples X = [2, 4, 6, 8, 10] Y = [10, 30, 50, 70, 90] The above dataset is regressed with least squares regression to $Y = \beta_0+\beta_1 X$. What is the best linear fit on this dataset?	4	3	1	3
b)	Why can't we use Mean Square Error (MSE) as a cost function for Logistic Regression? Explain Gradient Descent for Logistic Regression.	4	4	1	3
12. a)	What is a decision tree? Give decision trees to represent the following Boolean functions: i) A V ~ B ii) A Λ [B V C]	4	3	2	3
b)	Write and explain k-Nearest Neighbors algorithm. What are the advantages and disadvantages of KNN?	4	2	2	2

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13. a)	Demonstrate the implementation of binary logic functions OR and NOR using a perceptron.	4	4	3	3
b)	What is the purpose of multilayer perceptron? Solve the XOR problem using MLP.	4	4	3	3
14. a)	What is maximum a posteriori (MAP) hypothesis? Write and explain Naïve Bayes classification algorithm.	4	2	4	2
b)	Given the data below, predict the output (Flu?) for the following new instance using Naïve Bayes algorithm.	4	3	4	3

X: (Chills = N; Runny Nose=N, Headache=Strong, Fever=Y)

Chills	Runny Nose	Headache	Fever	Flu
Y	N	Mild	Y	N
Y	Y	No	N	Y
Y	N	Strong	Y	Y
N	Y	Mild	Y	Y
N	N	No	N	N
N	Y	Strong	Y	Y
N	Y	Strong	N	N
Y	Y	Mild	Y	Y

15. a)	What is partitioning clustering? Write and explain K-means clustering algorithm.	4	2	5	2
b)	Apply K-means clustering algorithm on the following data. Use $C_1(2,4)$ and $C_2(6,3)$ as initial cluster centers and use Euclidean distance as a similarity measure. Data: a(2,4), b(3,3), c(5,5), d(6,3), e(4,3), f(6,6)	4	3	5	3
16. a)	Select the best linear model with Mean Squared Error metric for the following data given two models 8.5*X + 0.5 and 7.2*X + 1.5.	4	4	1	3

X (Feature or input)- BMI	Y (Target or output)- BP
17	120
15	105
18	125
22	165
25	172
28	190

b)	Why SVM is called as maximum margin classifier? Explain the purpose kernel SVM with an example.	4	2	2	2

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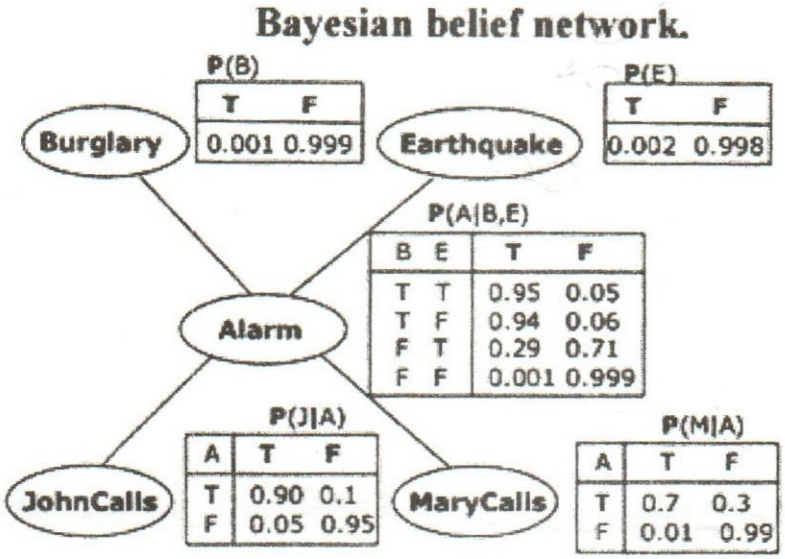
17.	Answer any ***two*** of the following:				
a)	Explain backpropagation learning to update the weights of an output layer in a multilayer neural network.	4	2	3	2
b)	For the Belief Network given below and the corresponding probabilities, compute the following probabilities. a) P(B, ~E, A, ~J, M) b) P(John calls | Burglary)  	4	3	4	3
c)	What is density-based clustering? Write and explain DBSCAN clustering algorithm.	4	2	5	3

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	35%
iii)	Blooms Taxonomy Level – 3 & 4	45%

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