Hall Ticket Number:

Code No. : 15656 N

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (I.T.) V-Semester Main Examinations, Jan./Feb.-2024

Artificial Intelligence and Machine Learning

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.	What is mean by exhaustive search? List a few exhaustive search techniques.	2	1	1	1
2.	What are the time and space complexities of BFS, DFS, DFID and Bi-directional search methods?	2	1	1	1
3.	Define validity, satisfiabilite and unsatisfiability of statements.	2	1	2	1
4.	What is Prenex Normal Form? Provide an example.	2	1	2	1
5.	What is Entropy? Provide the formula to compute information gain.	2	1	3	1
6.	List the kernels used in SVMs.	2	1	3	1
7.	Draw a perceptron model for OR gate.	2	1	4	1
8.	What is activation function? Provide any 4 activation functions.	2	1	4	1
9.	What is ensemble learning? How it helps to reduce bias and variance.	2	2	5	1
10.	Define reinforcement learning? Explain with suitable example.	2	2	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	Solve the following problem using A* algorithm Start state: 3 7 6 / 5 1 2 / 4 8 — Goal State: 5 3 6 / 7 2 / 4 1 8	5	3	1	2
b)	Compare Best First search and A* algorithms.	3	3	1	2
12. a)	Show that the following formulae are valid using tableau method. (i) $A \rightarrow (B \rightarrow A)$ (ii) $(\neg(AVB) \leftrightarrow (A \rightarrow B)$	4	3	2	2
b)	Explain the following resolution methods with examples. (i) backward chaining (ii) forward chaining (iii) rule collapsing	4	2	2	2
13. a)	Identify the first splitting attribute for the decision tree by using the ID3 algorithm with the following dataset.	4	4	3	2

AGE	Competition	Type	Class(profit)
Old	Yes	Software	Down
Old	No	Software	Down
Old	No	Hardware	Down
Mid	Yes	Software	Down
Mid	Yes	Hardware	Down
Mid	No	Hardware	Up
Mid	No	Software	Up
New	Yes	Software	Up
New	No	Hardware	Up
New	No	Software	Up

Contd... 2

b)	Apply K- Nearest neighbor algorithm to find the class label of (5,6). Select k=3. Dataset: {(1,1,*), (1,2,*), (2,3,*), (3,4, *), (4,5,*), (5,5,+), (4,6,+), (6,4, +), (6,6,*)}	4	4	3	2
14. a)	Explain the back propagation algorithm for multilayer perceptron with suitable example?	4	2	4	2
b)	Suppose you have a dataset of 10 emails with two features: "cheap" and "free." Email | "cheap" | "free" | Class --- Email 1 | 1 | 1 | Spam Email 2 | 0 | 1 | Not Spam Email 3 | 1 | 0 | Spam Email 4 | 0 | 1 | Not Spam Email 5 | 0 | 0 | Not Spam Email 6 | 1 | 1 | Spam Email 7 | 1 | 0 | Spam Email 8 | 1 | 0 | Spam Email 9 | 1 | 0 | Not Spam Email 10 | 0 | 1 | Not Spam Now, let's classify a new email with the features [1, 0] (contains "cheap" but not "free) using Naïve Bayes theorem	4	3	4	2
15. a)	Using K-means algorithm Cluster the following eight points (with (x, y) representing locations) into three clusters: A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9) Initial cluster centers are: A1(2, 10), A4(5, 8) and A7(1, 2).	4	4	5	2
b)	Explain DBSCAN Algorithm. Analyze its advantages and limitations.	4	4	5	2
16. a)	What is heuristic function? Provide any two admissible heuristic functions used in solving eight-puzzle problem.	4	2	1	2
b)	Find the resolvent of the clauses in the set $\{(AVB), (\neg AVD), (CV\neg B)\}$	4	4	2	2
17.	Answer any ***two*** of the following:				
a)	Illustrate the various loss functions used in regression and classification problems?	4	2	3	2
b)	How do you evaluate classification algorithms? Provide the formulas to compute precision, recall and F1-score.	4	2	4	2
c)	Compare partition, density and hierarchical based clustering algorithms	4	3	5	2

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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