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Code No. : 16635 O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (I.T.) VI-Semester Backlog Examinations, June-2022

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 control strategy in problem solving? List any two requirements for a good control strategy.	2	1	1	1
2.	Prove the following theorem using deductive inference rules (NDS) : from { $Q \rightarrow P, Q \rightarrow R$ } infer $Q \rightarrow (P \wedge R)$	2	3	1	2
3.	Differentiate between supervised and unsupervised learning	2	1	2	1
4.	Why is Mean Square Error (MSE) not suitable as a cost function for Logistic Regression?	2	2	2	1
5.	What are support vectors?	2	1	3	1
6.	State the limitation of using a Single-Layer perceptron?	2	2	3	1
7.	List any three Ensemble learning methods.	2	1	4	1
8.	Mention the advantage of using Bayesian Networks.	2	1	4	1
9.	Define Cluster Analysis.	2	1	5	1
10.	Given the contingency table for asymmetric binary variables, calculate the dissimilarity between Jack and Mary.	2	3	5	2

	Mary		
	1	0	Σ_{row}
1	2	0	2
0	1	3	4
Σ_{col}	3	3	6

Part-B (5 × 8 = 40 Marks)

11. a)	<p>Apply the A* Searching technique on the given state space and find at what cost the goal is found, show the contents of OPEN and CLOSED lists :</p>	4	3	1	2
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<p>b)</p>	<p>Consider the following facts:</p> <ul style="list-style-type: none"> i) John likes all kind of food ii) Apple and vegetable are food iii) Anything anyone eats and not killed is food. iv) Annie eats peanuts and is still alive v) Harry eats everything that Annie eats. <p>Prove by resolution that: “John likes peanuts”</p>	<p>4 3 1 2</p>																																																												
<p>12. a)</p>	<p>A study was conducted to understand the effect of number of hours the students spent studying to their performance in the final exams. You are given the following 8 samples from the study.</p> <p>No. of hours spent studying(x) = [10, 9, 2, 15, 10, 16, 11, 16] Score in the final exam(y) = [95, 80, 10, 50, 45, 98, 38, 93]</p> <p>Find the least square regression line for this data.</p>	<p>5 3 2 2</p>																																																												
<p>b)</p>	<p>Construct decision trees to represent the following Boolean functions:</p> <ul style="list-style-type: none"> i) $A \text{ XOR } B$ ii) $A \wedge (B \vee C)$ 	<p>3 3 2 2</p>																																																												
<p>13. a)</p>	<p>Explain the various aspects of SVM optimization objective.</p>	<p>4 2 3 1</p>																																																												
<p>b)</p>	<p>Design a Two-input perceptron that implements the boolean function: $A \wedge \neg B$</p>	<p>4 3 3 2</p>																																																												
<p>14. a)</p>	<p>For the Belief Network given below and the corresponding probabilities,</p>	<p>4 3 4 2</p>																																																												
<p>Bayesian belief network.</p> <p>The diagram shows a Bayesian belief network with the following structure and tables:</p> <ul style="list-style-type: none"> Burglary (Parent of Alarm): <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><th colspan="2">P(B)</th></tr> <tr><th>T</th><th>F</th></tr> <tr><td>0.001</td><td>0.999</td></tr> </table> Earthquake (Parent of Alarm): <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><th colspan="2">P(E)</th></tr> <tr><th>T</th><th>F</th></tr> <tr><td>0.002</td><td>0.998</td></tr> </table> Alarm (Parent of JohnCalls and MaryCalls): <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><th colspan="4">P(A B,E)</th></tr> <tr><th>B</th><th>E</th><th>T</th><th>F</th></tr> <tr><td>T</td><td>T</td><td>0.95</td><td>0.05</td></tr> <tr><td>T</td><td>F</td><td>0.94</td><td>0.06</td></tr> <tr><td>F</td><td>T</td><td>0.29</td><td>0.71</td></tr> <tr><td>F</td><td>F</td><td>0.001</td><td>0.999</td></tr> </table> JohnCalls (Child of Alarm): <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><th colspan="3">P(J A)</th></tr> <tr><th>A</th><th>T</th><th>F</th></tr> <tr><td>T</td><td>0.90</td><td>0.1</td></tr> <tr><td>F</td><td>0.05</td><td>0.95</td></tr> </table> MaryCalls (Child of Alarm): <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><th colspan="3">P(M A)</th></tr> <tr><th>A</th><th>T</th><th>F</th></tr> <tr><td>T</td><td>0.7</td><td>0.3</td></tr> <tr><td>F</td><td>0.01</td><td>0.99</td></tr> </table> 			P(B)		T	F	0.001	0.999	P(E)		T	F	0.002	0.998	P(A B,E)				B	E	T	F	T	T	0.95	0.05	T	F	0.94	0.06	F	T	0.29	0.71	F	F	0.001	0.999	P(J A)			A	T	F	T	0.90	0.1	F	0.05	0.95	P(M A)			A	T	F	T	0.7	0.3	F	0.01	0.99
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<p>compute the probability: $P(\text{John calls} \mid \text{Burglary})$</p>																																																														
<p>b)</p>	<p>What is Boosting? Explain with an example how AdaBoost Algorithm works.</p>	<p>4 2 4 1</p>																																																												

15. a)	How can clustering be applied for Recommendation systems? Explain with an example.	4	3	5	2
b)	Explain Agglomerative Hierarchical clustering with an example.	4	2	5	1
16. a)	Compare Exhaustive and Informed Search techniques with suitable examples.	4	2	1	1
b)	Why is KNN a non-parametric algorithm? What are the different distance measures that can be used to calculate distances between the test points?	4	1	2	1
17.	Answer any <i>two</i> of the following:				
a)	Explain back propagation algorithm with an example.	4	2	3	1
b)	State the Bayes' Theorem. What are the basic assumptions made in naïve Bayes model?	4	2	4	1
c)	Cluster the following eight points, with (x, y) representing locations, into three(K) 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)	4	3	5	1

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%
