Code No. : 16648 N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A+-- Grade

B.E. (I.T.) VI-Semester Main & Backlog Examinations, May/June-2023

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.	List various approaches to create intelligent systems?	2	1	1	1
2.	Outline problem characteristics which influence the solution for search problems?	2	2	1	1
3.	Define valid, consistent & incontinent logic formula.	2	1	2	1
4.	Relate bias and variance with overfitting and underfitting?	2	2	2	1
5.	What is overfitting in decision trees and how to correct it?	2	1	3	1
6.	What is feature selection and extraction?	2	1	3	1
7.	Explain XOR limitation of perceptron?	2	2	4	1
8.	Explain maximum likelihood estimation?	2	2	4	1
9.	Distinguish reinforcement learning with unsupervised learning?	2	4	5	2
10.	Compare classification with clustering tasks?	2	2	5	2

Part-B (5 × 8 = 40 Marks)

		M	L	CO	PO
11. a)	Illustrate A-star algorithm with the help of 8-tiles puzzle?	4	2	1	1
b)	Relate various heuristics used in 16-tiles puzzle?	4	2	1	2
12. a)	Construct predicate calculus formula for the following:	4	3	2	2

12. a) Construct predicate calculus formula for the following:

- Every student who makes good grades is brilliant or studies.
- Every student who is a CS major has some roommate. [Make ``roommate" a two-place predicate.]
- Every student who has any roommate who likes to party goes to Sixth Street.
- Anyone who goes to Sixth Street does not study.
- (Conclusion) If every roommate of every CS major like to party, then every student who is a CS major and makes good grades is brilliant

		M	L	CO	PO
b)	Apply resolution refutation technique to prove the conclusion from premises in 12 a).	4	3	2	2

13. a) Describe various approaches used to build recommendation systems. | 4 | 1 | 3 | 1

b) Construct a root node for a decision tree with ID3 for the following data. | 4 | 3 | 3 | 2

BRAND	COLOR	TIME	STOLEN
BMW	black	night	yes
AUDI	black	night	no
NISSAN	black	night	yes
VEGA	red	day	yes
BMW	blue	day	no
AUDI	black	day	yes
VEGA	red	night	no
AUDI	blue	day	yes
VEGA	black	day	yes
BMW	black	night	yes

14. a) Infer forward and backward pass formulas for the following MLP neural network? | 4 | 2 | 4 | 2

MLP having 2 inputs, 3 hidden neurons with RELU activation and 1 neuron in the output layer with logistic sigmoid activation.

b) Apply Naïve Bayes on the given example for <high, high, more, big, high> using the following dataset which describes the car evaluation dataset. | 4 | 3 | 4 | 2

BuyingPrice	Maintenance	Persons	Bootspace	Safety	Evaluation
vhigh	med	4	small	high	acc
vhigh	med	more	small	high	acc
high	high	more	big	med	acc
high	high	4	med	med	acc
med	vhigh	more	big	high	acc
low	low	more	small	med	acc
vhigh	vhigh	2	small	low	unacc
vhigh	vhigh	2	small	low	unacc
vhigh	med	2	small	med	unacc
vhigh	low	2	med	med	unacc
high	high	more	small	low	unacc
med	vhigh	more	small	low	unacc
med	med	2	big	med	unacc
low	vhigh	4	med	med	unacc
low	med	2	small	low	unacc
low	low	more	med	low	unacc
low	low	more	big	low	unacc

			M	L	CO	PO
15.	a)	Illustrate Q-learning algorithm for 3X3 2D Grid world?	4	3	5	2
	b)	Apply K-means algorithm for the following dataset using k=3? A1=(2,10), A2=(2,5), A3=(8,4), A4=(5,8), A5=(7,5), A6=(6,4), A7=(1,2), A8=(4,9). Assume A2, A5 & A8 are initial random centroids and employ Euclidean similarity metric.	4	3	5	2
16.	a)	Build states, actions and rules for the banana monkey problem described below. "A monkey is in a room. A bunch of bananas is hanging from the ceiling. The monkey cannot reach the bananas directly. There is a box in the corner of the room. How can the monkey get the bananas?"	4	3	1	2
	b)	Explain logistic regression algorithm in detail for binary classification?	4	2	2	1
17.		Answer any **two** of the following:				
	a)	What is max margin classifier? Define mathematical formulation for this optimization?	4	1	3	1
	b)	Build perceptron for AND Boolean function?	4	3	4	2
	c)	Apply Q-learning to Tic-Tac-Toe 2-player game?	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	32.5%
iii)	Blooms Taxonomy Level – 3 & 4	47.5%

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