Name……. Roll No……..

Dr B R Ambedkar National Institute of Technology, Jalandhar

B Tech 8th Semester (Information Technology)

ITPE-063: Artificial Intelligence Concepts

End-Semester Examination

Duration: 03 Hours Max. Marks: 50 Date: 26/05/2025

Marks Distribution & Mapping of Questions with Course Outcomes (COs)											
Question Number	1	2(a)	2(b)	3	4	5	6	7(a)	7(b)	8	9
Max. Marks	5	5	5	5	5	5	5	3	2	5	5
CO No.	2	3	4	1	4	2	4	1	1	4	1
*Cognitive Level	R	An	E	An	Ap	U	C	Ap	Ap	U	C
**Section/Chapter/Unit	1	2	2	4	3	3	6	5	5	3	4

*Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), and Create (C)

Q. No. **Marks**

1 Define an intelligent agent. Explain the PEAS framework with an example. 5

2 **(a)** Compare and contrast Depth-First Search (DFS) and Breadth-First Search (BFS) in terms of memory usage, completeness, optimality, and time complexity. 5+5

(b) In a given search space, the step cost from node to node is:

From	To	Cost
A	A	1
A	C	4
B	D	2
C	D	1
D	Goal	3

Apply Greedy Best-First Search using the following heuristic values (h)

Node	h(n)
A	7
B	4
C	2
D	1
Goal	0

Show the path selected by the algorithm. Justify whether this strategy is optimal for reaching the goal in this scenario.

3 Analyze the role of First-Order Predicate Logic (FOPL) in knowledge representation by discussing its syntax and semantics with examples. 2.5+2.5=5
Compare and contrast the use of universal and existential quantifiers, and evaluate their effectiveness in expressing real-world knowledge.

4 A medical test is used to detect a disease that affects 1% of the population. The test is 99% accurate for people who have the disease (true positive rate), and 95% accurate for those who do not have the disease (true negative rate). A person tests positive. What is the probability that this person actually has the disease? 5

5 Discuss the use of certainty factors in expert systems. Explain the role of certainty factors in decision making under uncertainty? 2+3=5

6 Imagine you are designing a medical expert system. Propose the knowledge acquisition method you would use. Design a rule-based inference structure and explain how you would handle incomplete or uncertain patient data. 5

7 **(a)** A single-layer perceptron has inputs x = [1, 0, 1], weights w = [0.4, 0.6, -0.5], and bias = -0.2. It uses the activation function: 3+2=5

$$f(net) = \begin{cases} 1, & if\ net >= 0 \\ 0, & if\ net < 0 \end{cases}$$

Compute the output of the perceptron.

(b) Discuss the concept of backpropagation and its role in training neural networks.

8 Given the following fuzzy set A = {(1, 0.2), (2, 0.5), (3, 1), (4, 0.7), (5, 0.3)}. Find: a) Support, b) Core, c) α-cut for α = 0.4. 5

9 Distinguish between declarative and procedural knowledge with examples. Apply this understanding by identifying one task in an expert system where each type of knowledge would be most appropriate and justify your choices. 5