BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MCA **SEMESTER: II**
BRANCH: MCA **SESSION: SP/2025**

SUBJECT: CA435 MODERN ARTIFICIAL INTELLIGENCE

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Define a rational agent in AI and examine its characteristics. Provide a suitable pictorial depiction and production rules to demonstrate the role of sensors and actuators in a robotic vacuum cleaner to perceive and act in its environment.	[5]	CO1	1,2
Q.1(b)	Considering suitable heuristics demonstrate how the 8-puzzle problem can be represented and solved as a state space search problem.	[5]	CO1	2
Q.2(a)	Examine the limitations of Greedy Best-First Search and describe how A* Search improves upon it in terms of pathfinding efficiency and optimality. Discuss the significance of a map coloring problem and explain how it can be represented as a constraint satisfaction problem.	[5]	CO2	4, 6
Q.2(b)	With a neat flow chart, demonstrate the working principle of a simple genetic algorithm.	[5]	CO2	2
Q.3(a)	Discuss the significance of knowledge representation in the development of intelligent systems. Outline the various approaches of knowledge representation in AI, emphasizing their advantages and disadvantages.	[5]	CO3	6, 2
Q.3(b)	Illustrate the differences between declarative and procedural knowledge with respect to AI based systems. Elaborate the process of forward reasoning that is used to generate inferences in expert systems.	[5]	CO3	2, 6
Q.4(a)	Summarize the contribution of probabilistic reasoning in the representation of knowledge under uncertainty. Explain the structure of a Bayesian Network using an appropriate illustration.	[5]	CO4	2
Q.4(b)	With a neat block diagram, explain how a supervised learning model learns from labelled data during training. Demonstrate the basic structure of a Rosenblatt perceptron model and discuss the process of weight update.	[5]	CO4	2
Q.5(a)	Demonstrate the primary components of an NLP system using a suitable block diagram. Elaborate the role of NLP in the design of virtual assistants and chatbots.	[5]	CO5	2,6
Q.5(b)	Describe the primary hardware components of a robot and outline their specific functions in robotic operation. Demonstrate the role of robots in industrial automation with an appropriate example.	[5]	CO5	2

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