





**PART B (10 x 2 = 20 Marks)**

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|---|-----|-------------------|
| 11. Outline the production system in Artificial Intelligence?                       | CO2 | [K <sub>2</sub> ] |
| 12. Differentiate between Simple Hill Generate and Test algorithm Climbing          | CO2 | [K <sub>2</sub> ] |
| 13. What are expert systems, and how do they utilize AI?                            | CO2 | [K <sub>2</sub> ] |
| 14. Specify the syntax of First-order logic in BNF form                             | CO2 | [K <sub>2</sub> ] |
| 15. What is a state space in AI, and how is it used in problem-solving?             | CO3 | [K <sub>2</sub> ] |
| 16. Differentiate between depth-first search (DFS) and breadth-first search (BFS).  | CO3 | [K <sub>2</sub> ] |
| 17. What is predicate logic, and how is it used in AI for knowledge representation? | CO4 | [K <sub>2</sub> ] |
| 18. Explain the difference between forward chaining and backward chaining.          | CO4 | [K <sub>2</sub> ] |
| 19. What is robotic perception, and why is it important in AI-driven robotics?      | CO5 | [K <sub>2</sub> ] |
| 20. Outline one ethical concern related to the use of AI in robotics.               | CO5 | [K <sub>2</sub> ] |

**PART C (6 x 5 = 30 Marks)**

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|--|-----|-------------------|
| 21. Apply hill-climbing search to solve the 8-puzzle problem. Describe its advantages and limitations.   | CO1 | [K <sub>3</sub> ] |
| 22. Consider the following knowledge:<br>"All humans are mortal".<br>"Socrates is a human".<br>"Socrates is mortal."<br>a) Translate the above sentence to predicate logic.<br>b) Prove that "Socrates is mortal." Using Resolution. | CO2 | [K <sub>3</sub> ] |
| 23. Explain how backward chaining works in an expert system.   | CO3 | [K <sub>2</sub> ] |
| 24. Apply constraint satisfaction problems (CSP) principle to solve a crossword puzzle.  | CO4 | [K <sub>3</sub> ] |
| 25. Describe how AI is used in robotic localization.   | CO5 | [K <sub>2</sub> ] |
| 26. Explain the supervised learning and unsupervised learning principles with an example   | CO3 | [K <sub>2</sub> ] |

**Answer any FOUR Questions**

**PART D (4 x 10 = 40 Marks)**

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|---|-----|-------------------|
| 27. Discuss in detail the informed search strategies and compare the analysis of various searches.  | CO1 | [K <sub>2</sub> ] |
| 28. Explain the role of predicate logic and how does it improve the expressiveness of knowledge compared to propositional logic? Illustrate with suitable examples. | CO2 | [K <sub>2</sub> ] |
| 29. Explain the following statistical learning methods in detail.<br>a. Linear Regression<br>b. Support Vector Machines   | CO3 | [K <sub>2</sub> ] |

The above network includes the following variables:

- **W1**: Spam Word
  - **W2**: Suspicious Attachment
  - **U**: Unknown Sender
  - **F**: Frequent Keywords
  - **S**: Spam Classification
- a) Given that the probability of W1 (Spam Word) being present in a spam email is 0.8 and the probability of W2 (Suspicious Attachment) is 0.6, what is the joint probability that both W1 and W2 are present, assuming they are independent?
- b) If  $P(S|W1 \cap W2) = 0.9$  and  $P(W1) = 0.8$   $P(W2) = 0.6$ , what is the marginal probability of spam classification  $P(S)$ .

31. Describe the challenges of planning uncertain movements in robotics. What methods can be employed to address these challenges, and how do they enhance robotic performance in dynamic environments?

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