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| **DIT UNIVERSITY DEHRADUN**   |  |  | | --- | --- | | **M.TECH (CSE)** | **END TERM EXAMINATION, ODD SEM 2024-25 (SEM I)** | | | | | | | | | | | | | |
| **Roll No.** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Subject Name: Artificial Intelligence and Knowledge Representation** | | | | | | | | | | | | |

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| **Time: 3 Hours** | **Total Marks: 100** |
| **Note: No student is allowed to leave the examination hall before the completion of the exam.**  **Answers from a section must be written together and must not be mixed with answers from other section.**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   |  |  |  |  | | --- | --- | --- | --- | | **SECTION 1: Attempt any five questions in SECTION 1: [5 x 8= 40]** | | | | |  | |  |  | | **Q.1.1)** | Analyze the logical formula ∀x ((P(x) ∨Q(x))∧(¬Q(x)→P(x))) by determining whether it is valid (tautology) or not across all interpretations. |  |  | | **Q.1.2)** | Apply the concept of inductive learning using decision trees to develop a model that can classify objects based on their features. |  |  | | **Q.1.3)** | (a) Compare and contrast the different types of environments in which intelligent agents operate. **[3 Marks]**  (b) Apply first-order logic to represent a scenario involving a family tree by defining individuals, relationships, and rules. Utilize inference rule to determine unknown relationships within the family. **[5 Marks]** |  |  | | **Q.1.4)** | (a) Apply the concept of problem formulation to a real-world situation “optimizing delivery routes”. **[4 Marks]**  (b)Explain the relevance of chosen state space, operators, initial state, and goal state for deriving solution of the above listed problem. **[4 Marks]** |  |  | | **Q.1.5)** | Analyze the following knowledge base in First-Order Logic (FOL) and determine whether the statement "Bird(Tweety)" implies "Flies(Tweety)":  Knowledge Base:   1. ∀x(Bird(x)→HasWings(x)) 2. ∀*x*(*Bird*(*x*)∧*HasWings*(*x*)→*Flies*(*x*)) 3. *Bird*(*Tweety*)   Apply appropriate inference rules and explain your conclusions. |  |  | | **Q.1.6)** | Evaluate the advantages and limitations of informed search strategies over uninformed ones. Discuss a real-world scenario where informed search could be applied. |  |  | | **SECTION 2: Attempt any four questions in SECTION 2: [4 x 15= 60]** | | | | |  | |  |  | | **Q.2.1)** | Evaluate the effectiveness of neural networks versus support vector machines (SVMs) for a medical diagnosis system that must accurately classify images as benign or malignant. Compare their advantages and limitations for this type of classification task. Which model would be more suitable for this context and why? |  |  | | **Q.2.2)** | Design a knowledge-based AI system for managing inventory in a retail environment. Outline how you would represent the knowledge using First-Order Logic (FOL) predicates and define rules for inventory reordering based on stock levels. |  |  | | **Q.2.3)** | (a) Convert the following statements into First-Order Logic (FOL) and check for logical consistency: (i) "Every professor who teaches AI is knowledgeable." (ii) "There exists a professor who does not teach AI." (iii) "All knowledgeable professors are well-published." Determine if there’s a contradiction or if all statements can coexist logically. **[7 Marks]** |  |  | | (b) Evaluate the use of Bayesian networks in predicting customer churn for an e-commerce company. Discuss the challenges and benefits of modeling customer behavior probabilistically. **[8 Marks]** |  |  | | **Q.2.4)** | (a) Apply Bayes’ Rule to a real-world scenario where probability can aid decision-making, such as predicting customer churn in a subscription service. **[7 Marks]** |  |  | | (b) Compare and contrast the benefits of supervised learning versus unsupervised learning in fraud detection systems for credit card transactions. Which method is more effective in this context? **[8 Marks]** |  |  | | **Q.2.5)** | Create a model for a self-driving car that uses a combination of decision trees and reinforcement learning to navigate complex road situations. Outline the structure of the model, specify the role of each component, and explain how they would interact in decision-making under diverse traffic conditions. |  |  | | **-----END OF PAPER ----** | |  |  | | |