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| **UNIT I INTRODUCTION** | | | |
| Introduction to Artificial Intelligence – Artificial Intelligence Problems – Timelines of Artificial Intelligence – Production Systems – State space Representation – Branches of Artificial Intelligence – Application of Artificial Intelligence. | | | |
| **PART A** | | | |
| **S.NO** | **QUESTIONS** | **BTL** |
| 1 | **Define Artificial Intelligence.**  It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions. | K2 |
| 2 | **Differentiate Human Intelligence and Artificial Intelligence.**   | **S. No.** | **Feature** | **Artificial Intelligence** | **Human Intelligence** | | --- | --- | --- | --- | | 1. | Emergence | AI is an advancement made by human insights; its early improvement is credited to Norbert Weiner who theorized on criticism mechanisms. | On the other hand, human creatures are made with the intrinsic capacity to think, reason, review, etc. | | 2. | Nature | Artificial intelligence (AI) strives to build machines that can mimic human behavior and carry out human-like tasks. | Human intelligence seeks to adapt to new situations by combining a variety of cognitive processes. | | 3. | State | Machines are digital. | The human brain is analogous. | | 4. | Function | AI-powered machines rely on input of data and instructions. | Humans use their brains’ memory, processing power, and cognitive abilities. | | 5. | Pace/Rate of AI and human | As compared to people, computers can handle more data at a speedier rate. For occurrence, in the event that the human intellect can solve a math problem in 5 minutes, AI can solve 10 problems in a minute. | In terms of speed, humans cannot beat the speed of AI or machines. | | K2 |
| 3 | **List the types of Artificial Intelligence?**  They are 3 Types of Artificial Intelligence  • Artificial Narrow Intelligence (ANI)  • Artificial General Intelligence (AGI)  • Artificial Super Intelligence (ASI) | K2 |
| 4 | **How the Turing Test can be applied to evaluate an AI system's ability to mimic human intelligence?**  Turing Test in AI  The Turing test was designed to prove the satisfactory operational definition of intelligence.  Consider, Player A is a computer, Player B is human, and Player C is an interrogator. Interrogator is aware that one of them is machine, but he needs to identify this on the basis of questions and their responses.  The conversation between all players is via keyboard and screen so the result would not depend on the machine's ability to convert words as speech.  The test result does not depend on each correct answer, but only how closely its responses like a human answer. The computer is permitted to do everything possible to force a wrong identification by the interrogator.  If an interrogator would not be able to identify which is a machine and which is human, then the computer passes the test successfully, and the machine is said to be intelligent and can think like a human. | K3 |
| 5 | **What is meant by Production System?**  Production system or production rule system is a computer program typically used to provide some form of artificial intelligence, which consists primarily of a set of rules about behavior but it also includes the mechanism necessary to follow those rules as the system responds to states of the world. | K2 |
| 6 | **Name the major branches of Artificial Intelligence?**  • Machine learning  • Neural Network  • Robotics • Expert Systems  • Fuzzy Logic  • Natural Language Processing | K2 |
| 7 | **List some applications of Artificial Intelligence.**  Google’s AI-powered predictions (E.g.: Google Maps) • Ride-sharing applications (E.g.: Uber, Lyft) • AI Autopilot in Commercial Flights • Spamfilters on E-mails • Plagiarism checkers and tools • Facial Recognition • Search recommendations • Voice-to-text features • Smart personal assistants (E.g.: Siri, Alexa) • Fraud protection and prevention. | K2 |
| 8 | **List the components of Production System?**  • Global Database  • Set of Production Rules  • A Control System | K2 |
| 9 | **Define State Space Representation.**  The production rule consists of a global database, set of rules and a goal. The initial state can be represented in the way in which computer can understand. This representation is known as **State Space Representation.** By taking up an applicable rule, we can derive another state in the solution path of the problem. The same has to be represented in the computer in a form in which it can understand.  State space representation is a process in artificial intelligence (AI) that explores all possible states of a problem until it finds one with the desired feature. It's a structured way to organize and explore the problem's possible configurations, which helps AI algorithms search for solutions efficiently. | K2 |
| 10 | **How to apply different machine learning techniques to a given dataset?**  1.Supervised Learning  i.Classification  ii.Regression  2.Unsupervised Learning  i.Clustering  3.Semi-supervised/Weakly Supervised Learning  4.Reinforcement Learning | K3 |
| 11 | **Apply the concept of state space to write a solution for the Tower of Hanoi problem.**   * **Initial State:** All disks are on the first peg, e.g., ([1, 2, 3], [], []) for 3 disks. * **Goal State:** All disks are moved to the target peg (e.g., the third peg), e.g., ([], [], [1, 2, 3]).   Given 3 disks, the output will show the sequence of states:   1. Move disk 1 to peg 3: ([2, 3], [], [1]) 2. Move disk 2 to peg 2: ([3], [2], [1]) 3. Move disk 1 to peg 2: ([3], [1, 2], []) 4. Move disk 3 to peg 3: ([], [1, 2], [3]) 5. Move disk 1 to peg 1: ([1], [2], [3]) 6. Move disk 2 to peg 3: ([1], [], [2, 3]) 7. Move disk 1 to peg 3: ([], [], [1, 2, 3])   Tower of Hanoi Puzzle | K3 |
| 12 | **How to solve the Missionaries and Cannibals problem as a state space problem and outline the steps to solve it.**  Each state can be represented by a tuple (M, C, B) where:   * M is the number of missionaries on the starting side (left bank). * C is the number of cannibals on the starting side (left bank). * B indicates the position of the boat (0 for the starting side, 1 for the destination side). * **Initial State:** All missionaries and cannibals are on the starting side, and the boat is also on that side, e.g., (3, 3, 0). * **Goal State:** All missionaries and cannibals are on the opposite side, and the boat is also on that side, e.g., (0, 0, 1). | K3 |
| 13 | **Illustrate Machine learning?**  Machine learning is a subfield of artificial intelligence, which is broadly defined as the capability of a machine to imitate intelligent human behavior. Artificial intelligence systems are used to perform complex tasks in a way that is similar to how humans solve problems. | K3 |
| 14 | **Analyze the key characteristics that distinguish Artificial Intelligence problems from other problem types.**  AI systems should be capable of learning from data or experiences and adapting their behaviour accordingly. This enables them to improve performance over time and handle new situations more effectively. Complexity: AI problems often involve dealing with complex systems or large amounts of data. | K4 |
| 15 | **Analyze the Tic-Tac-Toe problem as a state space representation.**  Each state in Tic-Tac-Toe can be represented as a 3x3 grid, where each cell can have one of three possible values:   * X: Indicates a move by Player X. * O: Indicates a move by Player O. * Empty: Indicates an unoccupied cell.   The initial state is an empty 3x3 board, where no moves have been made  The goal states in Tic-Tac-Toe are the terminal states where the game ends:   * **Winning States:** Any configuration where three of the same symbols (X or O) align horizontally, vertically, or diagonally   **Draw State:** A configuration where all cells are filled, but neither player has three in a row.  **Non-Terminal States:** Any state where the game is still ongoing, meaning there are empty cells, and no player has won yet.  Tic Tac Toe Algorith In Artificial Intelligence | With Solved Example | K4 |
| **PART B** | | | |
| **S.NO** | **QUESTIONS** | **BTL** |
| 1 | **Explain gaming tree concept for 8 tile puzzle problem.**  • A Game Tree is a structure for organizing all possible (legal) game states by the moves which allow transition from one game state to the next.  • This structure helps the computer to evaluate which moves to make because, by traversing the game tree, a computer (program) can easily see the outcome of a move and can decide whether to take it or not.    The following states are used to represent a game tree 1. The board state: This is an initial stage. 2. The current player: It refers to the player who will be making the next move. 3. The next available moves: For humans, a move involves placing a game token while the computer selects the next game state. 4. The game state: It includes the grouping of the three previous concepts. 5. Final Game States: In final game states, AI should select the winning move in such a way that each move assigns a numerical value based on its board state. | K2 |
| 2 | **Describe the artificial intelligence problem.**  • To understand AI, we can define some problems that we encounter in our daily life. • Almost all the problem stated in AI commonly uses the term STATE.  • It defines the state of the solution for given problem at that particular step.  • In short, the solution of a problem by a collection of the problem state.  • The problem solving procedure used is to apply an operator to a state to get the next state.  • The process of deriving a new state from the current state by applying the operator till desired state is reached is called State space approach Problems and how it is differ from other  • If a problem need symbolic representation in computer • If there is combinational explosion in out putting  • 8 queen problem • Travelling sales man problem  • Fuzzy set for un characterize data  • The Knowledge base of an AI problem is Voluminous.  • The data or Knowledge base is Changing fast  • Doing work without tiredness and fatigue. Characteristics of AI – How the Problem is analyzed  • Is the problem decomposable or not  • Can the solution steps be ignored  • Is the solution is universe predictable  • Is the solution to a problem is absolute or relative  • Is the knowledge base consistent or not  • The role of the knowledge  • Is the interaction with computer is Necessary. | K2 |
| 3 | **Explain how AI has evolved over time and why its development is timely in today's context.** | K2 |
| 4 | **Given two jugs of capacity 5l and 3l (litre), and a tap with an endless supply of water. The objective is to obtain 4 litres exactly in the 5-liter jug with the minimum steps possible. Write the production rules for obtaining the solution and draw the state space representation for the problem.**  **1. State Representation**  Each state can be represented by a tuple (x, y) where:   * x is the amount of water in the 5-liter jug. * y is the amount of water in the 3-liter jug.   **2. Initial State**   * The initial state is (0, 0), where both jugs are empty.   **3. Goal State**   * The goal state is (4, y) where x = 4 and y can be any value.   **4. Production Rules**  The production rules are the possible actions that can be taken at each step:   1. **Fill the 5-liter jug**: If x < 5, fill the 5-liter jug: (x, y) -> (5, y) 2. **Fill the 3-liter jug**: If y < 3, fill the 3-liter jug: (x, y) -> (x, 3) 3. **Empty the 5-liter jug**: If x > 0, empty the 5-liter jug: (x, y) -> (0, y) 4. **Empty the 3-liter jug**: If y > 0, empty the 3-liter jug: (x, y) -> (x, 0) 5. **Pour water from the 5-liter jug into the 3-liter jug**:    * If x > 0 and y < 3, pour water from the 5-liter jug into the 3-liter jug until either the 5-liter jug is empty or the 3-liter jug is full:      + If x + y <= 3: (x, y) -> (0, x + y)      + If x + y > 3: (x, y) -> (x - (3 - y), 3) 6. **Pour water from the 3-liter jug into the 5-liter jug**:    * If y > 0 and x < 5, pour water from the 3-liter jug into the 5-liter jug until either the 3-liter jug is empty or the 5-liter jug is full:      + If x + y <= 5: (x, y) -> (x + y, 0)      + If x + y > 5: (x, y) -> (5, y - (5 - x))   **5. State Space Representation**  The state space representation is a graph where nodes represent states (x, y) and edges represent the production rules (actions) that transition from one state to another. The solution is a path from the initial state (0, 0) to the goal state (4, y).  **6. Solution Steps**  One possible sequence of moves to achieve the goal with the minimum number of steps is as follows:   1. **(0, 0) → Fill 5-liter jug → (5, 0)** 2. **(5, 0) → Pour from 5-liter jug into 3-liter jug → (2, 3)** 3. **(2, 3) → Empty 3-liter jug → (2, 0)** 4. **(2, 0) → Pour from 5-liter jug into 3-liter jug → (0, 2)** 5. **(0, 2) → Fill 5-liter jug → (5, 2)** 6. **(5, 2) → Pour from 5-liter jug into 3-liter jug → (4, 3)** 7. **(4, 3) → Goal reached (4, y)**   **5. State Space Representation**  The state space representation is a graph where nodes represent states (x, y) and edges represent the production rules (actions) that transition from one state to another. The solution is a path from the initial state (0, 0) to the goal state (4, y).  **6. Solution Steps**  One possible sequence of moves to achieve the goal with the minimum number of steps is as follows:   1. **(0, 0) → Fill 5-liter jug → (5, 0)** 2. **(5, 0) → Pour from 5-liter jug into 3-liter jug → (2, 3)** 3. **(2, 3) → Empty 3-liter jug → (2, 0)** 4. **(2, 0) → Pour from 5-liter jug into 3-liter jug → (0, 2)** 5. **(0, 2) → Fill 5-liter jug → (5, 2)** 6. **(5, 2) → Pour from 5-liter jug into 3-liter jug → (4, 3)** 7. **(4, 3) → Goal reached (4, y)**   **7. State Space Diagram**  Jug Problem Wolfram Demonstrations Project, 57% OFF  Jug Problem Wolfram Demonstrations Project, 57% OFF  **Summary**  Production Rules: Describe the possible actions at each state, such as filling, emptying, or pouring water between jugs.  State Space Representation: Graphically represents the states and the transitions between them.  Minimum Steps Solution: A sequence of actions leading from the initial state (0, 0) to the goal state (4, y) in the fewest steps, illustrated by the sequence of states. | K3 |
| 5 | **Analyze how the different components and characteristics of a production system interact and contribute to its overall functionality.**  Control System, production system in ai  The components of [Production System in AI](https://www.wikidata.org/wiki/Q581319) encompass three essential elements:   1. **Global Database / Working Memory**: Also called the global database, this is a temporary storage area that holds facts about the current state of the problem or situation being analyzed by the system. 2. **Production Rules / Knowledge Base**: This is a collection of rules that encode domain-specific knowledge. Rules typically take the form of “IF (condition) THEN (action)”. For example, an expert system for medical diagnosis might have a rule like “IF the patient has a fever AND a rash, THEN there is a possibility of measles.” 3. **Control System / Inference Engine**: This is the control mechanism that iteratively evaluates the rules from the knowledge base against the contents of the working memory. It determines which rules are applicable and fires (executes) them, updating the working memory with new facts derived from applying the rules.   **Characteristics of Production System in AI**  AI Production Systems exhibit several key features that make them versatile and powerful tools for automated decision-making and problem-solving:   * **Simplicity:** Production Systems offer a straightforward way to encode and execute rules, making them accessible for developers and domain experts. * **Modularity:** These systems are composed of modular components, allowing for the addition, removal, or modification of rules without disrupting the entire system. This modularity enhances flexibility and ease of maintenance. * **Modifiability:**AI Production Systems are highly adaptable. Rules can be updated or replaced without extensive reengineering, ensuring the system remains up-to-date and aligned with evolving requirements. * **Knowledge-intensive:**They excel in handling knowledge-rich tasks, relying on a comprehensive global database. * **Adaptability:**AI Production Systems can dynamically adapt to new data and scenarios. This adaptability allows them to continuously improve. | K4 |

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| **PART C** | | | |
| **S.NO** | **QUESTIONS** | **BTL** |
| 1 | **Explain the concept of a Production System in AI and its main components. Give on example problem.** | K2 |
| 2 | **A man carries a cabbage, a goat and a wolf. He wants to across a river and there is a boat available, but he can take only one item at a time. In absence of man, wolf may eat goat or goat may eat cabbage. How can he take the entire three to the other side of the river. Solve this problem using production system.**  **1. State Representation**  Each state can be represented as a tuple (M, C, G, W) where:   * M represents the position of the man (left or right bank). * C represents the position of the cabbage. * G represents the position of the goat. * W represents the position of the wolf.   Each of these elements can be in either of two positions:   * L (Left bank) * R (Right bank)   **2. Initial State**   * The initial state is (L, L, L, L) where all items (man, cabbage, goat, and wolf) are on the left bank.   **3. Goal State**   * The goal state is (R, R, R, R) where all items are safely on the right bank.   **4. Production Rules**  The production rules define valid moves the man can make with or without an item. They must ensure that after each move, the goat is not left alone with the cabbage, and the wolf is not left alone with the goat.  **Valid Moves:**   1. **Man crosses alone:** (M, C, G, W) -> (M', C, G, W) 2. **Man takes cabbage:** (M, M, G, W) -> (M', M', G, W) 3. **Man takes goat:** (M, C, M, W) -> (M', C, M', W) 4. **Man takes wolf:** (M, C, G, M) -> (M', C, G, M')   **Constraints:**   * The goat cannot be left with the cabbage (i.e., (M, L, L, W) or (M, R, R, W) is invalid). * The wolf cannot be left with the goat (i.e., (M, C, L, L) or (M, C, R, R) is invalid).   **5. Control Strategy**  The control strategy involves systematically applying the rules to move from the initial state to the goal state, while avoiding invalid states.  **6. Solution Steps**  Here's the step-by-step solution using the production system:   1. **(L, L, L, L) → (R, L, R, L)**    * **Man takes the goat** across the river to the right bank. 2. **(R, L, R, L) → (L, L, L, L)**    * **Man returns alone** to the left bank. 3. **(L, L, L, L) → (R, R, L, L)**    * **Man takes the cabbage** across the river to the right bank. 4. **(R, R, L, L) → (L, R, R, L)**    * **Man brings the goat back** to the left bank. 5. **(L, R, R, L) → (R, R, R, R)**    * **Man takes the wolf** across the river to the right bank. 6. **(R, R, R, R) → (L, R, L, R)**    * **Man returns alone** to the left bank. 7. **(L, R, L, R) → (R, R, R, R)**    * **Man takes the goat** across the river to the right bank.   **Final Sequence:**   1. **(L, L, L, L) → (R, L, R, L)** (Man takes goat) 2. **(R, L, R, L) → (L, L, L, L)** (Man returns alone) 3. **(L, L, L, L) → (R, R, L, L)** (Man takes cabbage) 4. **(R, R, L, L) → (L, R, R, L)** (Man brings goat back) 5. **(L, R, R, L) → (R, R, R, R)** (Man takes wolf) 6. **(R, R, R, R) → (L, R, L, R)** (Man returns alone) 7. **(L, R, L, R) → (R, R, R, R)** (Man takes goat)   **7. State Space Representation**  The state space can be visualized as a graph where nodes represent states (M, C, G, W) and edges represent valid moves:  (L, L, L, L) -> (R, L, R, L) -> (L, L, L, L) -> (R, R, L, L)  | |  v v  (L, R, R, L) -> (R, R, R, L) -> (L, R, L, R)  |  v  (R, R, R, R) | K4 |
| 3 | **Enumerate the global database for the following problem and find a solution. A salesman must visit each of the 5 cities as shown in below figure. There is a road between every pair of cities and the corresponding distance are given. The problem is to find a minimal path that he visits each of the cities only one and returns to the starting city.** | K3 |
| 4 | **Explain and briefly tell about the Branches of Artificial Intelligence?** | K2 |
| 5 | **Explain about the Application of AI in various fields in today’s world?** | K2 |
| **UNIT II KNOWLEDGE REPRESENTATION** | | | |
| Knowledge Management - Types of Knowledge - Knowledge representation - Approaches to Knowledge representation - Issues in Knowledge representation - Knowledge base. First order Logic – Frames - Conceptual Dependency. | | | |
| **PART A** | | | |
| **S.NO** | **QUESTIONS** | **BTL** |
| 1 | **Define Knowledge Management.**  The knowledge management (KM) process comprises a set of activities for identification, gathering, creation, presentation and distribution of knowledge for the purposes of learning, reuse, and awareness. | K1 |
| 2 | **List the types of Knowledge.**  • Declarative Knowledge  • Procedural Knowledge  • Meta-knowledge  • Heuristic knowledge  • Structural knowledge | K1 |
| 3 | **Define Knowledge Representation.**  • Knowledge representation and reasoning (KR, KRR) is the part of Artificial intelligence which concerned with AI agents thinking and how thinking contributes to intelligent behaviour of agents.  • It is responsible for representing information about the real world so that a computer can understand and can utilize this knowledge to solve the complex real world problems such as diagnosis a medical condition or communicating with humans in natural language. | K1 |
| 4 | **List out the Issues in Knowledge Representation.**   1. Important Attributes 2. Relationship among attributes   3. Properties of Attributes  4. Choosing Granularity  5. Set of objects  6. Finding Right structure | K1 |
| 5 | **Differentiate declaration Knowledge and Procedural Knowledge.**  **Procedural Knowledge:**  • It is also known as imperative knowledge.  • Procedural knowledge is a type of knowledge which is responsible for knowing how to do something.  • It can be directly applied to any task.  • It includes rules, strategies, procedures, agendas, etc.  • Procedural knowledge depends on the task on which it can be applied.  **Example:**  It's basically “how” you know to do something. The classic example of procedural knowledge is riding a bicycle. When someone was teaching you how to ride a bicycle, no matter what they said, you probably struggled to grasp it until you'd actually done it a few times.  **Declarative knowledge:**  • Declarative knowledge is to know about something. • It includes concepts, facts, and objects. • It is also called descriptive knowledge and expressed in declarative sentences. • It is simpler than procedural language. | K2 |
| 6 | **State the semantic Network Representation.**  • Semantic networks are alternative of predicate logic for knowledge representation. In Semantic networks, we can represent our knowledge in the form of graphical networks.  • This network consists of nodes representing objects and arcs which describe the relationship between those objects. Semantic networks can categorize the object in different forms and can also link those objects.  • Semantic networks are easy to understand and can be easily extended. | K2 |
| 7 | **Illustrate Frames with example.**   * A frame is a record like structure which consists of a collection of attributes and its values to describe an entity in the world. Frames are the AI data structure which divides knowledge into substructures by representing stereotypes situations. * It consists of a collection of slots and slot values. These slots may be of any type and sizes. Slots have names and values which are called facets. | K3 |
| 8 | **Name the major parts of First Order Logic.** | K1 |
| 9 | **Solve the given statement using First Order Logic**  **Not all Students like both Maths and Science.**  ∃x(Student(x)∧(¬LikesMaths(x)∨¬LikesScience(x))) | K3 |
| 10 | **Modify the given statement using into FOL**  **Some integers are even and some are odd.**  ∃x(Integer(x)∧Even(x))∧∃y(Integer(y)∧Odd(y)) | K3 |
| 11 | **Differentiate Universal and Existential Quantifier with examples.**  **Universal quantifier:**  It is a symbol of logical representation, which specifies that the statement within its range is true for everything or every instance of a particular thing. The Universal quantifier isrepresented by a symbol ∀, which resembles an inverted A. If x is a variable, then ∀x is read as:  • For all x  • For each x  • For every x.  **Existential quantifier:**  they are the type of quantifiers, which express that the statement within its scope is true for at least one instance of something. It is denoted by the logical operator ∃, which resembles as inverted E. When it is used with a predicate variable then it is called as an existential quantifier. If x is a variable, then existential quantifier will be ∃x or ∃(x  • There exists a 'x.'  • For some 'x.'  • For at least one 'x.' | K2 |
| 12 | **Solve the following statements using Conceptual Dependency**   1. **John took the book.** 2. **John ate the ice cream with a spoon.** | K3 |
| 13 | **Apply Conceptual Dependency representation for the following**   1. **I took a book from Sally.** 2. **I gave a book to Sally.** | K3 |
| 14 | **Draw the architecture of Knowledge base agent.** | K4 |
| 15 | **Classify the ways of Knowledge Representation.**  • Logical Representation  • Semantic Network Representation  • Frame Representation  • Production Rules | K4 |
| **PART B** | | | |
| **S.NO** | **QUESTIONS** | **BTL** |
| 1 | **Explain the different types of Knowledge Representation.**      **Meta-knowledge:**   * Knowledge about the other types of knowledge is called Meta-knowledge. * It is knowledge about knowledge, and it's important for knowledge representation, information retrieval, and improving AI system efficiency. It involves understanding how different pieces of information relate to each other, and it can help judge the validity or appropriateness of knowledge. | K2 |
| 2 | **Describe the Knowledge Base Agent in Artificial Intelligence.**  Knowledge-based agents are those agents who have the capability of maintaining an internal state of knowledge, reason over that knowledge, update their knowledge after observations and take actions. These agents can represent the world with some formal representation and act intelligently. | K2 |
| 3 | **Explain in detail about the 2 types of Quantifiers with examples.**      **Universal quantifier:**  It is a symbol of logical representation, which specifies that the statement within its range is true for everything or every instance of a particular thing. The Universal quantifier is  represented by a symbol ∀, which resembles an inverted A. If x is a variable, then ∀x is read as:  • For all x  • For each x  • For every x.    **Existential quantifier:**  they are the type of quantifiers, which express that the statement within its scope is true for at least one instance of something. It is denoted by the logical operator ∃, which resembles as inverted E. When it is used with a predicate variable then it is called as an existential quantifier. If x is a variable, then existential quantifier will be ∃x or ∃(x  • There exists a 'x.'  • For some 'x.'  • For at least one 'x.'  **Examples:** | K2 |
| 4 | **Modify the given statement into First Order Logic**   1. **All penguins are birds.** 2. **All Information Technology students are smart** 3. **Not every Gardner likes the sun.** 4. **John is not tall.** 5. **Some birds lives in Antartica.**   **i) All penguins are birds.**  **FOL Statement:** ∀x(Penguin(x)→Bird(x))   * **Explanation:** For all individuals xxx, if xxx is a penguin, then xxx is also a bird.   **ii) All Information Technology students are smart.**  **FOL Statement:** ∀x(ITStudent(x)→Smart(x))   * **Explanation:** For all individuals xxx, if xxx is an Information Technology student, then xxx is smart.   **iii) Not every gardener likes the sun.**  **FOL Statement:** ¬∀x(Gardener(x)→LikesSun(x))  or  ∃x(Gardener(x)∧¬LikesSun(x))   * **Explanation:** There exists at least one individual xxx such that xxx is a gardener and xxx does not like the sun.   **iv) John is not tall.**  **FOL Statement:** ¬Tall(John)   * **Explanation:** John is not tall.   **v) Some birds live in Antarctica.**  **FOL Statement:** ∃x(Bird(x)∧LivesInAntarctica(x))   * **Explanation:** There exists at least one individual xxx such that xxx is a bird and xxx lives in Antarctica | K3 |
| 5 | **Analyze the railway ticket reservation and write the script of railway ticket reservation.** | K4 |

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| **PART C** | | | |
| **S.NO** | **QUESTIONS** | **BTL** |
| 1 | **Explain the issues in Knowledge Representation.** | K2 |
| 2 | **Explain the techniques in Knowledge Representation.** | K2 |
| 3 | **Explain in detail about First Order Logic.** | K2 |
| 4 | **Construct Conceptual Dependency representation of the following**   1. **John gave Mary a pencil.** 2. **Reji took the book from Jim.** 3. **Vinod stirred his Coffee with a Spoon.** 4. **Ram killed Ravan.** 5. **Sacin did not go to restaurant as terrorists attacked Mumbai.** | K3 |
| 5 | **Analyze the restaurant scenes and write a script for restaurant.**      The Restaurant Script. Adapted from Shank and Abelson (1977). | Download  Scientific Diagram  The Restaurant Script. Adapted from Shank and Abelson (1977). | Download  Scientific Diagram | K4 |