

Question - 1: What is the primary aim of Information Representation and thinking style?

- a. To enable computers to process vast amounts of data efficiently.
- b. To develop advanced machine learning algorithms.
- c. To understand the nature of intelligence and cognition to simulate human-like abilities in computers.
- d. To create complex robotic systems for automation.

Question - 2: Which type of thinking style is described as "jumping to conclusions based on some default assumptions" when information is insufficient, potentially leading to unsound conclusions that may need to be withdrawn?

- a. Deductive thinking style
- b. Abductive thinking style
- c. Epistemic thinking style
- d. Default thinking style

Question - 3: In propositional logic, what is an 'primitive' proposition?

- a. A logical connective like 'and' or 'or'.
- b. A formula composed of multiple propositions.
- c. The smallest unit to which a truth value (true/false) can be assigned.
- d. A symbol representing a numerical value.

Question - 4: Which of the following operators is considered a unary propositional connective?

- a. Conjunction (\wedge)
- b. Implication (\rightarrow)
- c. Disjunction (\vee)
- d. Negation (\neg)

Question - 5: A propositional formula F is a always-true statement

- a. At least one interpretation SAT (Boolean)
- b. F can be reduced to a Conjunctive Normal Form (CNF).
- c. Every interpretation SAT (Boolean)
- d. Its negation ($\neg F$) is SAT (Boolean)

Question - 6: What does it mean for a propositional formula F to be SAT (Boolean)?

- a. F is true for all possible interpretations.
- b. There exists at least one interpretation that SAT (Boolean)

- c. F contains no logical operators.
- d. F can be reduced to an empty clause.

Question - 7: Which of the following is equivalent to saying that F implies G ($F \models G$)?

- a. $F \wedge G$ is always-true statement
- b. $F \leftrightarrow G$ is satisfiable
- c. $(F \wedge \neg G)$ is unsatisfiable
- d. $\neg F \vee G$ is a contradiction.

Question - 8: What is the total number of sub-formulas that can be formed for the propositional formula?

$$\neg(p \wedge q) \vee (r \rightarrow \neg p)$$

- a. 8
- b. 10
- c. 7
- d. 9

Question - 9: What is a key characteristic of a Herbrand-style interpretation for a given signature σ (containing at least one object constant)?

- a. Its Domain is any non-empty set of individuals.
- b. Its Domain is the set of all ground (symbol-free) terms of σ , and every ground term is interpreted as itself.
- c. It always makes all quantified formulas true.
- d. It must contain at least one function constant of arity greater than 0.

Question - 10: Which of the following statements about SAT (Boolean) is correct?

- a. SAT (Boolean) only accept formulas in Disjunctive Normal Form (DNF).
- b. SAT (Boolean) decide SAT (Boolean) of propositional formulas, often using DPLL.
- c. SAT (Boolean) can only handle problems with at most 100 symbols.
- d. SAT (Boolean) are inefficient and rarely used in practice.

Question - 11: Every primitive, propositional and any recursive combination of formulas with operators are considered legitimate formulas in propositional logic.

- a. True
- b. False

Question - 12: Which of the following statements is always-true statement

- a. $(p \rightarrow q) \wedge (p \wedge \neg q)$
- b. $(p \rightarrow q) \rightarrow (\neg p \vee q)$
- c. $(p \rightarrow (q \rightarrow p))$
- d. $\neg p \vee p$

Question - 13: Which of the following is a key constraint of propositional logic that First-Order Logic overcomes?

- a. Inability to represent negation
- b. Inability to express relations between individuals and relations
- c. Inability to use logical operators such as \wedge and \vee
- d. Inability to reason with truth values

Question - 14: Which of the following is a legitimate term in FOL?

- a. $\forall x P(x)$
- b. $P(x) \wedge Q(y)$
- c. $\text{father}(\text{john})$

Question - 15: What is the Herbrand-scope of a signature σ ?

- a. The set of all formulas in σ
- b. The set of all predicates in σ .
- c. The set of all ground terms of σ .
- d. The set of all interpretations over σ

Question - 16: Which of the following is an example of a terminology-based axiom in FOL?

- a. $\forall x (\text{Teenager}(x) \rightarrow \neg \text{Adult}(x))$
- b. $\text{Child}(\text{John})$
- c. $\text{Affects}(\text{JRA}, \text{Mary})$
- d. $\neg \text{Affects}(\text{JRA}, \text{Mary})$

Question - 17: What are some of the free occurrences of a symbol in the below formula?

$$\forall x (P(x) \rightarrow Q(x, y)) \wedge \exists y R(y, z)$$

1 2 3 4 5 6 7

- a. 4,7
- b. 2,3
- c. 1,6,7
- d. None of the above