GUJARAT TECHNOLOGICAL UNIVERSITY

BE 7 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Artificial Intelligence - 3170716

Chapter 1: Introduction

Repeated Questions:

1. Turing Test and Artificial Intelligence:

- **Q.** Explain the "Turing test". **(WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks)**
- **Q.** Define Artificial Intelligence; state applications/task domains of AI. **(SUMMER 2022, 3 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; SUMMER 2024, 3 Marks; SUMMER 2024, 4 Marks)**

2. AI Problem Characteristics:

- **Q.** Explain AI problem characteristics in detail. **(WINTER 2022, 7 Marks OR; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks)**
- **Q.** Discuss and analyze Tower of Hanoi problem with respect to the seven problem characteristics. **(SUMMER 2023, 7 Marks; SUMMER 2026, 7 Marks)**

Other Important Questions:

1. Artificial Intelligence Concepts:

- **Q.** Give classification of Artificial Intelligence. **(WINTER 2025, 3 Marks)**
- **Q.** What is "Artificial Intelligence and Artificial Intelligence Technique"? **(WINTER 2023, 3 Marks)**

Chapter 2: Problems, State Space Search & Heuristic Search Techniques

Repeated Questions:

1. Control Strategy and State Space:

- **Q.** Discuss the requirement of a good control strategy in AI / State the requirements of a good control strategy. **(SUMMER 2024, 3 Marks; WINTER 2025, 4 Marks)**
- **Q.** Explain Water Jug Problem with state space representation/search. **(SUMMER 2022, 4 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)**

2. Heuristic Search Techniques:

- **Q.** Explain Best First Search algorithm with suitable example. **(SUMMER 2022, 7 Marks; SUMMER 2023, 4 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Explain Hill Climbing / steepest hill climbing / simple hill climbing and its improvements. **(WINTER 2022, 4 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 7 Marks; SUMMER 2024, 3 Marks OR)**
- **Q.** Define/explain local maximum, plateau and ridge. **(SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks OR; SUMMER 2026, 3 Marks)**
- **Q.** Explain A* search / stages of A* search with example. **(WINTER 2023, 7 Marks; WINTER 2025, 7 Marks)**

3. Constraint Satisfaction:

- **Q.** Discuss Constraint Satisfaction Problem with example / formulation as search problem. **(WINTER 2022, 7 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 7 Marks OR; SUMMER 2026, 4 Marks)**
- **Q.** Solve the following cryptarithmetic problem using constraint satisfaction. [Data truncated in source – refer to the original question paper] **(SUMMER 2024, 4 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**

4. Problem Reduction:

- **Q.** Explain Problem Reduction using “AND-OR” graph. **(WINTER 2022, 4 Marks; SUMMER 2024, 3 Marks)**

Other Important Questions:

1. Search Algorithms and Heuristics:

- **Q.** Differentiate Hill Climbing and Best First Search algorithm. **(WINTER 2025, 3 Marks)**
- **Q.** Differentiate between Breadth First Search and Best First Search. **(SUMMER 2026, 4 Marks)**
- **Q.** Write an algorithm for Breadth First Search. **(WINTER 2022, 3 Marks)**
- **Q.** What is heuristic search? Discuss with an example. **(WINTER 2022, 3 Marks)**
- **Q.** Describe heuristic function for the Travelling Salesman Problem. **(SUMMER 2026, 3 Marks)**

2. Problem Representation:

- **Q.** What is State Space of a Problem? **(SUMMER 2023, 3 Marks)**
- **Q.** Explain state space search with the use of 8 Puzzle Problem. **(WINTER 2022, 7 Marks)**
- **Q.** What is production system? Discuss the components of production system. **(WINTER 2022, 4 Marks)**
- **Q.** Explain means-end analysis approach to solve AI problems. **(WINTER 2023, 4 Marks)**
- **Q.** In the missionaries and cannibals problem, describe state space representation, actions, start and end state. **(SUMMER 2024, 7 Marks OR)**

Chapter 3: Knowledge Representation

Repeated Questions:

1. Knowledge Representation Approaches:

- **Q.** Differentiate procedural and declarative knowledge. **(WINTER 2022, 3 Marks OR; SUMMER 2024, 3 Marks OR; WINTER 2025, 3 Marks)**
- **Q.** Discuss different approaches/methods to knowledge representation. **(WINTER 2022, 7 Marks; WINTER 2025, 4 Marks)**
- **Q.** Explain Semantic Net with example / property inheritance using “isa” and “instance”. **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2026, 7 Marks)**

2. Predicate Logic and Inference:

- **Q.** Explain unification / unification algorithm in predicate logic. **(SUMMER 2023, 4 Marks OR; WINTER 2023, 7 Marks; WINTER 2025, 3 Marks OR)**
- **Q.** Translate sentences into predicate logic and use resolution/forward chaining. **(SUMMER 2022, 7 Marks; SUMMER 2023, 7 Marks; SUMMER 2024, 3 Marks; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Differentiate propositional logic and predicate logic. **(WINTER 2023, 3 Marks; WINTER 2025, 3 Marks OR; SUMMER 2026, 4 Marks OR)**
- **Q.** Define Modus Ponens and Horn Clause. **(SUMMER 2022, 3 Marks; SUMMER 2026, 4 Marks OR)**

3. Forward and Backward Reasoning:

- **Q.** Explain forward and backward reasoning / forward chaining and backward chaining with example. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 3 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 4 Marks OR; SUMMER 2026, 4 Marks)**

Other Important Questions:

1. Knowledge Representation and Logic:

- **Q.** Explain the different issues in Knowledge Representation. **(SUMMER 2023, 4 Marks)**
- **Q.** What is clausal form? How is it useful? **(WINTER 2023, 4 Marks)**
- **Q.** What are the limitations of Propositional Logic? **(SUMMER 2023, 4 Marks)**
- **Q.** Explain Inference Rules in Propositional Calculus. **(WINTER 2023, 4 Marks OR)**
- **Q.** Write and explain algorithm for resolution in propositional logic with suitable example. **(WINTER 2022, 7 Marks OR)**

Chapter 4: Symbolic Reasoning Under Uncertainty

Repeated Questions:

1. Non-monotonic Reasoning:

- **Q.** Explain/define non-monotonic reasoning. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 3 Marks OR; WINTER 2023, 3 Marks; SUMMER 2024, 4 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks OR)**

Other Important Questions:

None identified.

Chapter 5: Probabilistic Reasoning

Repeated Questions:

1. Bayes' Theorem and Bayesian Networks:

- **Q.** Explain Bayes' theorem / Bayesian Networks / probability application. **(SUMMER 2022, 4 Marks; WINTER 2022, 3 Marks; SUMMER 2023, 7 Marks OR; WINTER 2023, 3 Marks OR; WINTER 2025, 7 Marks)**

2. Fuzzy Logic:

- **Q.** Explain Fuzzy Logic: membership function, linguistic variable, crisp vs fuzzy, defuzzification, fuzzy sets. [Diagram required – refer to the original question paper] **(SUMMER 2022, 4 Marks OR; SUMMER 2023, 3 Marks OR; WINTER 2023, 3 Marks OR; SUMMER 2024, 4 Marks)**

Other Important Questions:

None identified.

Chapter 6: Game Playing

Repeated Questions:

1. MiniMax and Alpha-Beta Pruning:

- **Q.** Explain MiniMax search procedure and/or Alpha-Beta cut-offs/pruning in game playing. **(SUMMER 2022, 4 Marks; SUMMER 2022, 4 Marks OR; WINTER 2022, 7 Marks; SUMMER 2023, 4 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**

Other Important Questions:

None identified.

Chapter 7: Planning

Repeated Questions:

1. Goal Stack Planning:

- **Q.** Explain Goal Stack Planning. **(SUMMER 2024, 4 Marks; SUMMER 2026, 3 Marks OR)**

Other Important Questions:

1. Planning Techniques:

- **Q.** Explain Hierarchical Planning. **(WINTER 2025, 3 Marks OR)**
- **Q.** Discuss Nonlinear Planning using Constraint Posting with example. **(SUMMER 2026, 7 Marks OR)**
- **Q.** Explain the components of planning system. **(WINTER 2022, 4 Marks)**

Chapter 8: Natural Language Processing

Repeated Questions:

1. Phases of Natural Language Processing:

- **Q.** Explain steps/phases of Natural Language Processing. **(SUMMER 2022, 3 Marks OR; SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR)**
- **Q.** Explain morphological and syntax analysis phases of NLP. **(WINTER 2022, 4 Marks OR; WINTER 2023, 3 Marks; WINTER 2025, 4 Marks OR)**

Other Important Questions:

1. NLP Analysis and Applications:

- **Q.** What is semantic analysis in NLP, and how is it different from syntactic processing? **(WINTER 2025, 3 Marks)**
- **Q.** Discuss Morphological Analysis in Natural Language Processing. **(SUMMER 2026, 3 Marks)**
- **Q.** Explain Syntax Analysis in Natural Language Processing. **(SUMMER 2026, 3 Marks)**
- **Q.** Briefly explain any one application of Natural Language Processing. **(SUMMER 2022, 3 Marks)**
- **Q.** State the factors which may make understanding of natural language difficult for a computer. **(SUMMER 2024, 3 Marks OR)**

Chapter 9: Connectionist Models

Repeated Questions:

1. Neural Network Models:

- **Q.** Explain Hopfield Network. **(SUMMER 2023, 3 Marks; SUMMER 2024, 7 Marks OR; WINTER 2025, 4 Marks OR)**
- **Q.** Explain Backpropagation algorithm in Neural Network. **(SUMMER 2022, 7 Marks OR; WINTER 2023, 4 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Explain connectionist models / perceptron with example. **(WINTER 2022, 3 Marks OR; WINTER 2023, 3 Marks; SUMMER 2026, 3 Marks; SUMMER 2026, 7 Marks OR)**

2. Learning in Neural Networks:

- **Q.** Explain learning / learning techniques / supervised and unsupervised learning. **(WINTER 2022, 3 Marks OR; WINTER 2023, 4 Marks; SUMMER 2024, 7 Marks)**

Other Important Questions:

1. Artificial Neural Network:

- **Q.** Explain Artificial Neural Network. **(SUMMER 2022, 7 Marks)**

Chapter 10: Expert Systems

Repeated Questions:

1. Expert System Shells and Architecture:

- **Q.** Explain Expert System Shells with example. **(SUMMER 2022, 3 Marks; SUMMER 2023, 3 Marks OR)**
- **Q.** Explain architecture of Expert System with suitable sketch. [Diagram required – refer to the original question paper] **(SUMMER 2022, 3 Marks OR; WINTER 2022, 7 Marks OR)**

Other Important Questions:

1. Expert System Development:

- **Q.** Describe the Expert System Development Procedure. **(WINTER 2023, 7 Marks)**

Chapter 11: Genetic Algorithms

Repeated Questions:

1. Genetic Operators:

- **Q.** Explain basic operators/crossover operators in Genetic Algorithms. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2023, 3 Marks OR; WINTER 2025, 3 Marks)**

Other Important Questions:

1. Genetic Algorithm Concepts:

- **Q.** Describe working principle of Genetic Algorithm. **(SUMMER 2026, 4 Marks)**
- **Q.** Explain Roulette-Wheel selection method of genetic algorithm. **(SUMMER 2022, 7 Marks)**

Chapter 12: Introduction to Prolog

Repeated Questions:

1. Prolog Predicates:

- **Q.** Demonstrate the use of Cut and Fail predicates in Prolog with example. **(SUMMER 2023, 4 Marks OR; WINTER 2023, 7 Marks; SUMMER 2024, 4 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 3 Marks OR; SUMMER 2026, 3 Marks OR)**

2. Prolog Programs:

- **Q.** Write Prolog programs for factorial/list operations (display list, append, count elements, count character, minimum, nth element). **(WINTER 2022, 7 Marks OR; SUMMER 2023, 7 Marks; SUMMER 2024, 4 Marks; WINTER 2025, 4 Marks; WINTER 2025, 7 Marks OR; SUMMER 2026, 4 Marks OR)**

Other Important Questions:

1. Prolog Programs and Features:

- **Q.** Write a Prolog program to find GCD of two numbers. **(SUMMER 2026, 4 Marks)**
- **Q.** Demonstrate the use of Repeat Predicate in Prolog with example. **(WINTER 2022, 4 Marks)**
- **Q.** What are the Applications, Features and Limitations of Prolog? **(WINTER 2023, 7 Marks OR)**

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