DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE
ARVIND GAVALI COLLEGE OF ENGINEERING, SATARA
EVEN SEM 2025-26
CA1 Examination

Course: B. Tech.	**Class: B.Tech**	**Semester: VII**
Branch: C.S.E.	**Subject Code & Name: BTCOC701**	**Artificial Intelligence**
Max Marks: 30	**Date:**	**Duration: 01:30 Hrs**

Instructions to the Students:
(**1**) Illustrate your answers with neat sketches wherever necessary.
(2) Figures to the right indicate full marks.
(3) Assume suitable data if necessary.
(4) Preferably, write the answers in sequential order.

Q.1 Objective type questions. (All questions are compulsory)

1. What is the primary goal of Artificial Intelligence?
   a) To develop hardware with high computational speed
   b) To create systems that can perform tasks requiring human intelligence
   c) To replace all human activities with machines
   d) To automate all types of physical labor — CO1 — 1 Mark

2. Which of the following is NOT considered a foundation of AI? — CO1 — 1 Mark
   a) Philosophy b) Psychology c) Linguistics d) Geography

3. Who is regarded as the "Father of Artificial Intelligence"?
   a) Alan Turing b) John McCarthy c) Marvin Minsky d) Herbert Simon — CO1 — 1 Mark

4. Which of the following best defines a problem-solving agent? — CO2 — 1 Mark
   a) An agent that randomly explores the environment b) An agent that plans sequences of actions to achieve goals
   c) An agent that only reacts to current percepts without planning d) An agent that ignores its performance measure

5. In AI, searching for solutions refers to:
   a) Executing all possible actions in the environment — CO2 — 1 Mark
   b) Systematically exploring the state space to find a sequence of actions that leads to the goal
   c) Random guessing of possible outcomes
   d) Only using heuristic values without considering the state space

6. Which of the following is an example of an uninformed search strategy? — CO2 — 1 Mark
   a) Breadth-First Search b) Depth-First Search c) Uniform-Cost Search d) All of the above

Q .2 Solve Any two of the following.

A. What is Artificial Intelligence? Explain its future scope — CO1 — 6 marks

Artificial Intelligence (AI) is a branch of computer science that aims to create systems capable of **thinking, reasoning, learning, and making decisions** similar to humans. It combines techniques from **mathematics, statistics, cognitive science, computer engineering, and data science** to enable machines to mimic human-like intelligence.

Core Components of AI

AI is not a single technology but a collection of interrelated fields.

- **Machine Learning (ML):** Algorithms that learn from data to improve performance over time without explicit programming. *Example: Email spam filtering, fraud detection.*
- **Deep Learning (DL):** A subset of ML that uses **artificial neural networks** to recognize complex patterns. *Example: Face recognition, self-driving cars.*
- **Natural Language Processing (NLP):** Enables machines to understand and respond in human language. *Example: ChatGPT, Google Translate, voice assistants.*
- **Computer Vision:** Allows machines to interpret and analyze visual data like images and videos. *Example: Medical image analysis, facial recognition, surveillance.*
- **Robotics:** AI-powered robots perform physical tasks intelligently. *Example: Industrial robots, delivery drones, humanoid robots.*

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 Expert Systems: Rule-based systems that mimic human experts in specific domains. *Example: Medical diagnostic systems.*

Applications of AI
AI touches almost every aspect of modern life:
 Healthcare: Disease prediction, drug discovery, robotic surgeries.
 Finance: Stock market prediction, fraud detection, credit scoring.
 Education: Smart tutors, adaptive learning, plagiarism detection.
 Transportation: Self-driving cars, traffic management, logistics.
 Agriculture: Crop monitoring, soil testing, drone spraying.
 Military & Defense: Autonomous drones, surveillance systems.
 Entertainment: Personalized recommendations, AI-generated music/art.

Benefits of AI
 Automation of repetitive tasks.
 Improved accuracy and efficiency.
 Cost reduction and productivity increase.
 Enhanced decision-making with big data insights.

Future Scope of AI
AI is one of the fastest-growing technologies, and its future scope is vast across multiple domains. Some key areas are:
1. **Healthcare**
o AI-based systems for early diagnosis, personalized treatment, and drug discovery.
o Robotic surgeries and medical image analysis.
2. **Education**
o Personalized learning platforms using AI tutors.
o Smart content, automated grading, and virtual classrooms.
3. **Business & Industry**
o Predictive analytics for decision-making.
o Automating repetitive tasks, enhancing productivity, and reducing costs.
4. **Transportation**
o Development of fully autonomous vehicles and AI-powered traffic management.
o Smart logistics and supply chain optimization.
5. **Agriculture**
o Smart farming using AI for crop monitoring, soil analysis, and pest detection.
o Drone-based agricultural solutions.
6. **Cybersecurity**
o AI-powered threat detection and prevention systems.
o Fraud detection in financial transactions.
7. **Daily Life Applications**
o Smart homes, personal assistants, and lifestyle management.
o AI in entertainment (gaming, media personalization).
8. **Scientific Research & Space Exploration**
o AI algorithms for analyzing large datasets from experiments.
o Autonomous robots and rovers in space missions.

B. Write down brief history and evolution of Artificial Intelligence CO1 6 Marks

The history of Artificial Intelligence (AI) dates back to ancient times when philosophers such as Aristotle speculated about logic and reasoning, while later mathematicians like Descartes, Leibniz, and Boole developed symbolic logic and mechanical calculators. In the 1940s, the invention of digital computers, influenced by the work of Alan Turing and the Von Neumann architecture, laid the foundation for AI. Alan Turing, in 1950, introduced the famous *Turing Test* to evaluate whether a machine could exhibit human-like intelligence. In 1951, Marvin Minsky and Dean Edmonds created the first neural network machine, and in 1956, the Dartmouth Conference, led by John McCarthy, officially coined the term "Artificial Intelligence." This marked the birth of AI as a formal discipline, with early programs such as Newell and Simon's *Logic Theorist* (1955) and *General Problem Solver* (1957) pioneering problem-solving approaches.

The period between the mid-1950s and early 1970s was marked by great enthusiasm, with researchers believing human-level AI was imminent. Early systems demonstrated capabilities in symbolic reasoning and games like chess. However, limited

computing power and small memory capacities soon revealed the challenges, leading to the **first AI winter (1974–1980)** when funding and interest declined. AI revived in the 1980s with the emergence of **expert systems**—rule-based programs designed to simulate human decision-making. Systems such as *MYCIN* (for medical diagnosis) and *DENDRAL* (for chemical analysis) gained recognition, and Japan launched its Fifth Generation Computer Systems (FGCS) project to advance AI. Despite these advancements, the high costs and complexity of expert systems led to disillusionment, causing the **second AI winter** in the late 1980s and 1990s.

Nevertheless, research in neural networks, particularly the introduction of the backpropagation algorithm in 1986, sustained AI research during this period.

From the 2000s onward, AI entered a new era, driven by the availability of big data, faster computing power (especially GPUs), and improved algorithms. Major milestones during this period include IBM's *Deep Blue* defeating chess champion Garry Kasparov in 1997, IBM's *Watson* winning the quiz show *Jeopardy!* in 2011, and Google's *AlphaGo* defeating world champion Lee Sedol in 2016. Today, AI is deeply integrated into everyday life and industries, powering technologies such as voice assistants, autonomous vehicles, robotics, medical diagnosis systems, and natural language processing models like ChatGPT.

In summary, the evolution of AI reflects a journey of high expectations, periods of setbacks, and groundbreaking achievements. From its philosophical and mathematical roots to modern applications of machine learning and deep learning, AI continues to advance rapidly and holds great promise for achieving even greater levels of intelligence, possibly moving toward Artificial General Intelligence (AGI) in the future.

C. Explain in detail, the structure of different intelligent agents. CO1 6 Marks

An **intelligent agent** is a system that perceives its environment through sensors and acts upon that environment using actuators in order to achieve goals. The structure of an agent defines **how it decides what actions to take** based on what it perceives.

1. Simple Reflex Agents

Idea: "Action depends only on the current percept."

 Structure:

o **Sensors** → perceive the environment.

o **Condition-Action Rules** → rules of the form *IF condition THEN action*.

o **Actuators** → perform the action.

Working:

 Ignores history, only reacts to the present percept.

 Example: A thermostat.

 IF temperature < 20°C → TURN ON heater.

 IF temperature ≥ 20°C → TURN OFF heater.

Limitations:

 Works only in **fully observable environments**.

 Can't handle complex, dynamic, or partially observable situations.

2. Model-Based Reflex Agents

Idea: "Action depends on both current percept and an internal model of the world."

 Structure:

o **Sensors** → perceive environment.

o **Internal State (Model of the World)** → stores unobserved aspects and history of percepts.

o **Condition-Action Rules** → applied using both percepts and internal model.

o **Actuators** → perform actions.

 Working:

o Maintains an internal **world model** that reflects how the environment evolves and how actions affect it.

o Example: A self-driving car must remember past observations (e.g., a hidden pedestrian behind a parked truck).

 Advantages:

o Works in **partially observable environments**.

o More intelligent and adaptive than simple reflex agents.

3. Goal-Based Agents

Idea: "Action depends on achieving specific goals."

 Structure:

o **Sensors** → perceive environment.

o **Internal Model (State Information)**.

o **Goals** → describe desired situations or outcomes.
o **Search/Planning Module** → selects actions that help achieve goals.
o **Actuators** → perform chosen actions.
 Working:
o Uses reasoning: *Given my current state and goal, what sequence of actions will achieve it?*
o Example: A robot delivery agent.
 Goal: Deliver package to Room 102.
 Uses pathfinding (A*, Dijkstra's) to choose route.
 Advantages:
o More flexible than reflex agents.
o Can pursue new goals dynamically.

4. Utility-Based Agents
Idea: "Action depends on maximizing utility (happiness, performance, or satisfaction)."
 Structure:
o **Sensors** → perceive environment.
o **Internal Model**.
o **Utility Function** → maps a state (or outcome) to a numeric value representing "happiness" or "preference."
o **Decision-Making Module** → chooses actions that maximize expected utility.
o **Actuators** → perform action.
 Working:
o When multiple goals or conflicting situations exist, utility helps select the best trade-off.
o Example: Autonomous taxi.
 Goal: Take passenger to airport.
 Utility: Shortest time, safest route, least fuel consumption → chooses optimal balance.
 Advantages:
o Handles **uncertainty** and **trade-offs**.
o More rational than pure goal-based agents
5. Learning Agents
Idea: "Action improves over time by learning from experience."
 Structure:
 Performance Element → chooses actions based on percepts.
 Learning Element → improves the performance element using feedback.
 Critic → gives feedback on performance (compares outcome with desired outcome).
 Problem Generator → suggests exploratory actions to learn new things.
 Actuators → perform actions.
 Working:
 Learns models of the environment, utility functions, or action policies from experience.
 Example: A chess-playing program that improves by playing thousands of games against itself.
 Advantages:
 Adapts to unknown or dynamic environments.
 Becomes better over time without full programming.

Q. 3 Solve Any two of the following.

A. Give the outline of uniform cost search algorithm with suitable example.	CO2	6 Marks
B. Write A* algorithm and discuss the various observations about algorithm	CO2	6 Marks
C. Explain how the steepest accent hill climbing works and Heuristic functions?	CO2	6 Marks