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Department of Artificial Intelligence and Machine Learning

AI Foundations for Engineers (CI114AT)

CIE – 1 MODEL QUESTION BANK

SHORT ANSWER TYPE QUESTIONS

Q. No.	Question	Topic / Subtopic	CO	BT	Marks
1	Define Artificial Intelligence in one sentence.	Introduction – What is AI?	CO1	L1	1
2	Who is considered the father of Artificial Intelligence?	History of AI	CO1	L1	1
3	Name any two pioneers in the development of AI.	History of AI	CO1	L1	1
4	What is a key criterion for a machine to pass the Turing Test?	Acting Humanly – Turing Test Approach	CO1	L1	1
5	Mention the role of Natural Language Processing in the Turing Test.				
5	List the four main approaches to AI.	Approaches to AI	CO1	L1	1
6	Which branch of mathematics is essential for probability-based AI models?	Foundations – Mathematics	CO1	L1	1
7	State one contribution of neuroscience to AI.	Foundations – Neuroscience	CO1	L1	1
8	What is the role of psychology in Artificial Intelligence?	Foundations – Psychology	CO1	L2	2
9	Expand the acronym LISP and state its importance in AI.	AI Languages & Tools	CO1	L1	1
10	Mention one application of AI in healthcare.	Applications of AI	CO1	L1	1
11	What do you mean by a Toy Problem in AI?	Problem Formulation in AI	CO1	L2	2
12	Name any one AI programming language other than LISP.	AI Languages & Tools	CO1	L1	1
13	State one advantage of the Acting Rationally approach in AI.	Acting Rationally –	CO1	L2	2

			Rational Agent			
14	Which year is considered the birth year of AI as a field of study?	History of AI	CO1	L1	1
15	Name one contribution of Computer Engineering to AI.	Foundations – Computer Engineering	CO1	L1	1
16	Write one limitation of the Thinking Humanely approach.	Thinking Humanely – Cognitive Modeling	CO1	L2	2
17	Give an example of an AI-based real-world problem.	Applications of AI	CO1	L2	2
18	Which AI pioneer proposed the concept of the General Problem Solver (GPS)?	History of AI	CO1	L1	1
19	Name any one branch of Economics that influences AI decision-making.	Foundations – Economics	CO1	L2	2
20	What is the main focus of the Thinking Rationally approach?	Thinking Rationally – Laws of Thought	CO1	L1	1
21	What is the relationship between optimization methods and machine learning model training?	Foundations – Mathematics / Optimization	CO1	L2	2
22	What similarities exist between market equilibrium in economics and optimization in AI algorithms?	Foundations – Economics	CO1	L2	2
23	In what ways do theories of human memory help us understand the design of AI knowledge representation systems?	Foundations – Psychology / Cognitive Science	CO1	L2	2
24	What is the relationship between control theory and the stability of autonomous AI agents?	Foundations – Computer Engineering / Control Theory	CO1	L2	2
25	During 2018, the most common issues in news articles on AI were 'ethical: data privacy and algorithm bias.' If the sentiment shifted to positive, what is the most logical implication about the perception of AI technology?	Risks and Benefits of AI	CO1, CO4	L2	2
26	Training time for image recognition dropped by a factor of two in two years, and the computing power for top AI applications is doubling every 3 months. What is the most significant consequence of these two related trends?	State of the Art in AI	CO1	L2	2
27	Describe the field of AI that has been adopted over time, with the arrangement of the following factors in a sequential ordering: Machine Learning, Possibility of AI, Probabilistic Models, Expert Knowledge/Logic.	History of AI Development	CO1	L2	2

28	Which of the main AI subfields, based on the growth in publications, is considered the primary driver of AI research expansion between 2010 and 2019?	State of the Art in AI	CO1	L2	2
29	Google Duplex making restaurant reservations by conducting a fluent conversation on the user's behalf is a demonstration that successfully integrates and applies which combination of AI subfields' capabilities?	Applications of AI / Rational Agent	CO1	L2	2
30	Hypothesize why the ethical concern of "algorithm bias" is often related to "data privacy" in the context of mass surveillance and tailored information flows.	Responsible AI – Ethics	CO4	L2	2
31	The agent's percept sequence refers to _____ of perceived things.	Intelligent Agents – Percepts	CO1	L1	1
32	The instruments used for perceiving and acting upon the environment are ____ and ____.	Agents and Environments	CO1	L1	1
33	The problem generator is present in _____ agent.	Intelligent Agents – Learning Agent	CO1	L1	1
34	_____ agent deals with happy and unhappy states.	Utility-Based Agents	CO1	L1	1
35	The _____ element in agent is used for selecting external actions.	Agent Architecture	CO1	L1	1
36	Steering and accelerator describes the _____ for an automated taxi driver agent.	Agents and Environments – Actuators	CO1	L1	1
37	The presence of carpet and other obstacles describes the _____ for a vacuum cleaner agent.	Agents and Environments – Environment Description	CO1	L1	1
38	A simple thermostat turns on the furnace when the temperature is at least 3 degrees below the setting and turns off when the temperature is at least 3 degrees above the setting. This thermostat is the instance of _____ agent.	Simple Reflex Agent	CO1	L2	2
39	A delivery drone plans its route by evaluating various possible paths and selecting the one that minimizes delivery time and energy consumption. This drone is an instance of a _____ agent.	Goal-Based Agent	CO1	L2	2
40	A smart home lighting system tracks the status of lights as on or off and the time of day to decide illumination levels for comfort and safety. This system is an instance of a ___ agent.	Model-Based Reflex Agent	CO1	L2	2
41	A stock-trading bot assigns a numerical score to each portfolio option based on expected return, risk tolerance, and user preference, and then chooses the one with the highest score. This bot is an instance of a _____ agent.	Utility-Based Agent	CO1	L2	2

42	_____ element of the learning agent provides feedback.	Learning Agent Components	CO1	L1	1
43	A _____ environment has finite number of percepts.	Nature of Environments	CO1	L1	1
44	A/An _____ environment has a series of one-shot actions, and only the current percept is required for the action.	Episodic Environment	CO1	L1	1
45	_____ international standard provides the framework for AI management systems covering the entire AI lifecycle.	Responsible AI Standards	CO4	L1	1
46	OECD refers to _____.	Responsible AI Frameworks	CO4	L1	1
47	State the stochastic versions of the vacuum cleaner agent.	Intelligent Agents – Environment Types	CO1	L2	2
48	Can there be more than one agent program that implements the given agent function? Give an example.	Agent Functions	CO1	L2	2
49	What is the relation between an agent and its environment?	Agents and Environments	CO1	L2	2
50	Is a software agent the same as an intelligent agent? Justify	Agents and Environments	CO1	L2	2
51	Write an example for a Search Problem.	Search Problems and Solutions	CO1	L1	1
52	What is the purpose of the transition model in a search problem definition?	Search Problems and Solutions	CO1	L1	1
53	Differentiate between a path and an optimal path.	Search Problems and Solutions	CO1	L1	1
54	An abstract mathematical description of the problem is called as _____	Search Problems and Solutions	CO1	L1	1
55	A toy problem is a simplified, abstract version of a complex real-world problem that is used primarily for educational, illustrative, or experimental purposes. Justify with an example.	Search Problems and Solutions	CO1	L1	2

LONG ANSWER TYPE QUESTIONS

Q. N o.	Question	Topic / Subtopic	CO	BT	Mar ks
1	Define Artificial Intelligence in multiple contexts (acting humanly, thinking humanly, thinking rationally, acting rationally).	Approaches to AI: Turing / Cognitive / Laws of Thought /	CO1	L3	4

		Rational Agent			
2	Trace the historical development of AI from 1950 to 2000.	History of AI; State of the Art (historical evolution)	CO1	L4	6
3	Discuss two key milestones and their impact on AI development.	History of AI; State of the Art	CO1	L4	6
4	Compare the strengths and limitations of the "Thinking Humanly" and "Acting Rationally" approaches.	Thinking Humanly vs Acting Rationally; Foundations (psychology vs rational agent)	CO1	L4	6
5	Explain how Economics has influenced the growth of AI applications.	Foundations – Economics; Decision-making & optimization	CO1	L3	4
6	Differentiate between Toy Problems and Real-World Problems in AI.	Problem formulation: Toy vs Real-world problems	CO1	L3	4
7	Analyse the similarities and differences between biological neural networks and artificial neural networks in terms of information processing.	Foundations – Neuroscience vs ML basics	CO1	L4	6
8	How can cognitive psychology theories of attention be applied to enhance machine learning algorithms?	Foundations – Psychology → Applications to ML	CO1	L4	6
9	Analyse how insights from behavioural psychology can help address bias in AI models.	Responsible AI (bias) + Foundations – Psychology	CO4	L4	6
10	How can feedback AI-based control theory be applied to stabilize autonomous robotic systems?	Foundations – Control Theory; Autonomou	CO1	L4	6

		s agents stability			
11	Analyse the influence of cybernetic principles on the design of self-regulating AI systems.	Foundations – Cybernetics / Self-regulation / Agents	CO1	L4	6
12	How would you explain the role of cost-benefit analysis in AI decision-making models?	Foundations – Economics / Rational agent decision-making	CO1	L3	4
13	How would you summarize the influence of human perception studies on computer vision in AI?	Foundations – Psychology → Computer Vision applications	CO1	L3	4
14	How would you explain the role of sensors and actuators in AI-driven robotic systems?	Agents and Environments – Perception & Action (sensors/actuators)	CO1	L3	4
15	How did Bellman's "Markov decision processes" and Simon's idea of "good enough" decisions help in shaping the way AI agents make choices today?	Foundations – Economics / Decision Theory / MDPs / Bounded Rationality	CO1	L4	6
16	Explain the difference between the progress of AI in language tasks versus vision tasks as reported in the AI Index.	State of the Art – AI Index trends (NLP vs CV)	CO1	L4	6
17	Identify the major ethical concerns raised in AI-related media coverage and explain why they are essential.	Responsible AI – Media, Ethics (bias, privacy, safety)	CO4	L4	6

18	Describe the role of diversity in AI research and explain the implications of current gender disparities.	Responsible AI – Social implications, Diversity & Inclusion	CO4	L4	6
19	Summarize how AI has been applied successfully in medicine and what challenges remain for clinical adoption.	Applications of AI – Healthcare; Risks & Adoption	CO1, CO4	L4	6
20	Assess whether self-driving cars, as reported by AI100, represent a safe and scalable solution for the near future.	Applications & Risks – Autonomous Vehicles; AI100 report	CO1, CO4	L4	6
21	How does the risk that AI technology might hinder fundamental democratic values, a core societal concern highlighted in the 2016 AI100 report's conclusion regarding the future deployment of AI technology, arise?	Risks & Benefits; Societal impacts; Responsible AI	CO4	L4	6
22	Evaluate the claim that "AI progress is now limited more by social factors (ethics, bias, privacy) than by technical accuracy." Do you agree? Why?	Responsible AI – Social limits vs technical limits	CO4	L4	6
23	Assess whether current AI achievements in games (chess, Go, Dota 2) are true indicators of intelligence, or only demonstrations of computational power.	State of the Art: Indicators of intelligence vs benchmarks	CO1	L4	6
24	Analyze how AI's progress in climate science (detecting extreme weather) could influence global policy decisions.	Applications – Climate science; Societal impact & policy	CO1, CO4	L4	6
25	Critically assess the analogy of the "Gorilla Problem." If humans cede control to Superintelligent AI, is the Gorilla Problem primarily about physical control, or about existential control over humanity's long-term future? Justify your answer.	Risks & Benefits; Long-term safety; Superintelligence thought experiments	CO4	L4	6

26	Evaluate the risk associated with AI in safety-critical applications. What specific technical challenge, inherent to systems developed using machine learning techniques, makes formal verification and risk analysis more difficult?	Risks – Safety-critical systems; Verification challenges for ML	CO4	L4	6
27	Justify the need for AI to develop ethical and technical standards at least comparable to those in engineering and healthcare. What commonality in outcomes links AI applications to these established fields?	Responsible AI – Standards & regulation; Ethics parallels	CO4	L4	6
28	Apply Francis Bacon's observation about the "mechanical arts" to modern AI. How does it illustrate both benefits and risks?	Philosophical foundations; Societal implications of technology	CO1, CO4	L4	6
29	Evaluate the scalability concern of lethal autonomous weapons and explain why this risk is unique compared to traditional weapons.	Risks – Lethal autonomous weapons; Unique AI scaling risks	CO4	L4	6
30	Examine how biased training data in machine learning can reinforce systemic inequalities in society.	Responsible AI – Bias, societal harms	CO4	L4	6
31	Discuss whether AI's role in healthcare should be limited to assistance or extended to autonomous decision-making.	Applications & Ethics – Healthcare autonomy vs assistance	CO1, CO4	L4	6
32	If you apply the cybersecurity risks of AI to financial systems, what could be the worst-case scenario?	Risks – Security in critical infrastructure (finance)	CO4	L4	6
33	Examine how the King Midas problem represents the difficulty of specifying AI goals.	Responsible AI – Specification problems; Goal alignment (King Midas)	CO4	L4	6

#	Question	Topic	CO	L	Marks
34	Discuss whether regulation or self-governance by AI corporations is more effective in minimizing risks.	Governance & Regulation; Responsible AI policy	CO4	L4	6
35	Critically evaluate Demis Hassabis's statement: "First solve AI, then use AI to solve everything else." Is it realistic or risky?	Philosophy of AI research priorities; Risks & strategy	CO1, CO4	L4	6
36	Assess whether the potential benefits of superintelligent AI justify continuing its research despite existential risks.	Long-term risks vs benefits; Research ethics	CO4	L4	6
37	Critique the assumption that new jobs will always emerge after technological disruption, in the context of AI.	Societal impacts: Economics of automation	CO4	L4	6
38	Define the following terms: Rationality, Percept, Agent function, Agent program.	Intelligent Agents – Core definitions	CO1	L2	4
39	Write the PEAS description by selecting one application relevant to your engineering branch of the task environment from the list below and characterizing it in terms of the properties. i. Network Optimization Agent (TE) ii. Smart Bridge Monitoring System (CV) iii. Warehouse Automation System (IM) iv. Semiconductor Fab (EC) v. Process Control System (CH) vi. Autonomous Flight Control System (AS) vii. CNC Machining System (ME) viii. Smart Grid Management System (EE)	Agents and Environments – PEAS modeling; Application-specific task environments	CO1	L3	4
40	"There is a task environment where the actual score of agent A2 will be higher than the actual score of agent A1, assuming that agent A1 is rational and agent A2 is irrational". Justify this statement and, when appropriate, provide examples or counterexamples to support this claim.	Rationality; Performance measure; Agent evaluation (limits of rationality)	CO2 (explicitly involves problem-solving/agent behavior assessment)	L4	6
41	In a fixed machine architecture, does every program uniquely define an agent's behavior? Discuss the	Agent function vs	CO1	L3	4

	distinction between an agent's function and its program in this scenario.	agent program; Implementation vs specification			
42	Consider a modified vacuum-cleaner environment where the agent loses one point for every movement. a) Can a simple reflex agent still act perfectly rationally in this scenario? b) If the agent maintains internal state, can it then be perfectly rational? Design such an agent. How would the answers change if the agent's sensors show the clean/dirty status of all squares at once?	Agents & Environments; Rationality; Agent design (reflex vs stateful)	CO1	L4	6
43	The pseudocode for three agent programs A, B, and C is as given below: In each of these agents, the function f is some arbitrary, possibly randomized, function of its inputs with no internal state of its own. The agent program runs on a computer with unbounded memory but finite clock speed. Assume all actions are instantaneous. For each environment below, identify which agent can be perfectly rational for a. fully observable, deterministic, discrete, single-agent, and static. b. partially observable, deterministic, discrete, single-agent, and static. c. partially observable, stochastic, discrete, single-agent, and dynamic.	Agents and Environments; Perfect rationality; Relationship between agent program & environment	CO1	L4	6
44	Discuss the Four Phases of the Problem-Solving Process, used by a Problem-Solving Agent.	Search Problems and Solutions	CO1	L2	4
45	Write the state-space graph for the two-cell vacuum world, and formulate it as a grid world problem.	Formulating Problems - Theory and Practice	CO1	L4	6

The pseudocode block for agent programs:

```
function A(percept)
return f_A()

function B(percept)
return f_B(percept)

function C(percept)
persistent: percepts, initially []
percepts ← push(percept,percepts)
return f_C(percepts)
```

No.	Question	Topic / Subtopic	CO	BT	Marks
46	Give the standard problem formulation of the 8-Puzzle Problem	Formulating Problems - Theory and Practice	CO1	L4	6
47	Give the problem formulation for the airline travel problem.	Formulating Problems - Theory and Practice	CO1	L4	6
48	Give the problem formulation for the Sokoban Puzzle problem.	Formulating Problems - Theory and Practice	CO1	L4	6

VERY LONG ANSWER TYPE QUESTIONS

Q. No.	Question	Topic / Subtopic	CO	BT	Marks
1	Evaluate whether ChatGPT is "thinking" or "acting" in the context of AI approaches.	Approaches to AI – Thinking vs Acting; Case Application	CO1	L5	8
2	Explain the four main approaches to AI with suitable examples.	Approaches to AI – Acting Humanly, Thinking Humanly, Thinking Rationally, Acting Rationally	CO1	L3	8
3	Categorize 12 different AI systems into the four AI approaches (Acting Humanly, Thinking Humanly, Thinking Rationally, Acting Rationally).	Approaches to AI – Classification and Analysis	CO1	L4	8
4	Analyze the interdisciplinary foundations of AI by highlighting the roles of Mathematics, Economics,	Foundations of AI –	CO1	L4	10

		Neuroscience, Psychology, and Computer Engineering.	Interdisciplinary Links			
5		Discuss the evolution of AI by identifying major pioneers, breakthroughs, and challenges across decades.	History and Evolution of AI	CO1	L4	10
6		How can philosophical theories of consciousness be applied to the development of explainable AI systems?	Foundations – Philosophy / Consciousness / Explainable AI	CO1, CO4	L5	8
7		Compare and analyse different philosophical perspectives (dualism, materialism, physicalism) in shaping debates on whether AI can truly "understand."	Foundations – Philosophy of Mind and AI	CO1	L5	8
8		How can probability theory be applied to improve uncertainty handling in AI decision-making models?	Foundations – Mathematics / Probability	CO1	L4	8
9		Analyse the role of linear algebra and calculus in the functioning of deep learning architectures.	Foundations – Mathematics / Linear Algebra & Calculus	CO1	L4	8
10		How can principles of game theory be applied to design negotiation algorithms for autonomous agents?	Foundations – Economics / Game Theory / Multi-Agent Systems	CO1	L4	8
11		Analyse how economic models of rational choice differ from bounded rationality when applied to AI systems in market simulations.	Foundations – Economics / Rational Choice vs Bounded Rationality	CO1	L4	8
12		How can findings from brain plasticity research be applied to improve continual learning in AI systems?	Foundations – Neuroscience / Learning Mechanisms	CO1	L4	8

13	Summarize the main predictions made in the AI100 (2016) report about the future of AI applications.	State of the Art – AI100 Report / Future of AI	CO1, CO4	L3	8
14	Apply the concept of "human benchmarks" to evaluate whether current AI systems can truly be considered intelligent.	AI Evaluation Metrics / Human-Level Intelligence	CO1	L5	8
15	Evaluate how the rapid improvement in training speed (100x reduction) could influence the accessibility of AI research.	State of the Art – Computational Advances	CO1	L5	8
16	Discuss whether the shift from human-programmed rules to machine-learned models poses more opportunities or risks for society.	Responsible AI – Machine Learning vs Rule-Based Systems	CO4	L5	10
17	Evaluate the argument that AI surveillance erodes privacy more severely than traditional surveillance.	Responsible AI – Privacy & Ethics	CO4	L5	10
18	Judge whether global cooperation on AI safety is feasible, given competing national interests in economic and military advantage.	Responsible AI – Global Governance & Ethics	CO4	L6	10
19	For each of the following task environment properties, rank the given examples from most to least according to how well they satisfy the property. Also, state any assumptions made to justify the ranking. Fully observable: Driving, Medical Diagnosis System, Chess Playing. Continuous: Financial Trading Algorithm, Robot Arm Manufacturing, Elevator control system. Stochastic: Assembly Line Quality Control, Stock Market Analysis, Weather Forecasting System. Static: Chatroom, Checkers, Digital Library Search	Intelligent Agents – Environments (Observable, Continuous, Stochastic, Static)	CO1	L4	8
20	Discuss in brief the current regulatory landscape governing Artificial Intelligence under the India AI Mission, along with key global frameworks and initiatives shaping responsible AI governance worldwide.	Responsible AI – Governance / India AI Mission / Global Standards	CO4	L4	8
21	List and explain the core principles of Responsible AI with domain-specific examples.	Responsible AI – Core Principles (Fairness,	CO4	L3	10

		Accountability, Transparency, Privacy)			
22	Discuss how an intelligent agent evolves from a simple reflex agent to a model-based, goal-based, utility-based, and finally a learning agent with a case study (domain-specific).	Intelligent Agents – Agent Evolution & Architectures	CO1	L4	10
23	Give the formal definition of a Search Problem, highlighting all the components.	Search Problems and Solutions	CO1	L2	8
24	Consider a robotic navigation problem where a robot needs to find the shortest path from a starting location (Point A) to a destination (Point B) within a specified environment represented as a grid. The robot can move up, down, left, or right to adjacent cells unless blocked by obstacles. Define the components of a search problem for this robotic navigation scenario, listing the Initial State, Actions, State Space, Transition Model, Goal State, and Path Cost.	Formulating Problems - Theory and Practice	CO1	L4	10
25	Consider a scenario where an automated vehicle needs to navigate through city streets to pick up passengers and drop them off at various locations. Define the components of a search problem for this automated vehicle routing, listing the Initial State, Actions, State Space, Transition Model, Goal State, and Path Cost.	Formulating Problems - Theory and Practice	CO1	L4	10