

AIML Lecture 3 MCQ

Expert Systems

1. **What is the primary purpose of an Expert System?**
 - a) To perform complex mathematical calculations.
 - b) **To simulate the decision-making ability of a human expert in a specific domain.**
 - c) To store large amounts of raw data.
 - d) To generate random facts and rules.
2. **Which component of an Expert System is described as "the brain – stores facts and rules"?**
 - a) Inference Engine
 - b) User Interface
 - c) **Knowledge Base**
 - d) Explanation Facility
3. **In a medical expert system, if the system uses the rule "IF fever AND sore throat THEN possible flu," what type of knowledge is this rule an example of?**
 - a) Declarative knowledge
 - b) **Procedural knowledge**
 - c) Factual knowledge
 - d) Information knowledge
4. **The "logical processing unit that applies reasoning to the knowledge base to derive conclusions" is known as the:**
 - a) User Interface
 - b) Knowledge Base
 - c) **Inference Engine**
 - d) Developer Interface
5. **A patient enters symptoms like "fever," "headache," and "runny nose" into a medical system. The system then matches these facts with rules and concludes "The patient might have flu." This process is an example of which reasoning mechanism?**

- a) Backward Chaining
 - b) Goal-Driven Reasoning
 - c) **Forward Chaining**
 - d) Hypothetical Reasoning
6. **Which type of chaining starts with a goal and looks for rules that support it, asking questions to verify conditions?**
- a) Forward Chaining
 - b) Data-Driven Reasoning
 - c) **Backward Chaining**
 - d) Conclusion-Driven Reasoning
7. **The component that allows humans to interact with an expert system, such as inputting information and receiving decisions, is called the:**
- a) Knowledge Acquisition Module
 - b) **User Interface**
 - c) Developer Interface
 - d) External Interface
8. **What is the primary function of the Explanation Facility in an expert system?**
- a) To update or improve the system's knowledge.
 - b) To store temporary facts during a reasoning session.
 - c) **To explain how and why a certain conclusion was reached.**
 - d) To link to external databases.
9. **Consider a financial expert system that needs to retrieve real-time stock prices or customer account data. Which optional component would facilitate this?**
- a) Working Memory
 - b) **External Interfaces**
 - c) Developer Interface
 - d) User Interface
10. **Which of the following is NOT listed as a key component of Expert Systems according to the sources?**
- a) Knowledge Base
 - b) Inference Engine
 - c) **Emotional Processor**
 - d) Explanation Facility

11. **What is the term for "raw facts" in the context of data, information, and knowledge?**
 - a) Knowledge
 - b) Information
 - c) **Data**
 - d) Insights
12. **What does "98.6°F is a normal body temperature" represent in the context of data, information, and knowledge?**
 - a) Data
 - b) Information
 - c) **Knowledge**
 - d) Raw fact
13. **If an expert system is designed to diagnose blood infections and provide rule-based treatment suggestions, it is most analogous to which historical expert system?**
 - a) DENDRAL
 - b) XCON
 - c) HEARSAY
 - d) **MYCIN**
14. **A significant limitation of expert systems is that they are built using manual rules created by human experts and struggle to keep up-to-date. This directly implies they:**
 - a) Are highly scalable to complex problems.
 - b) Can learn from data and improve over time.
 - c) **Lack learning capability and don't improve with experience.**
 - d) Are robust with incomplete or conflicting rules.
15. **Which expert system famously automated the configuration of computer systems and saved DEC \$25 million?**
 - a) MYCIN
 - b) DENDRAL
 - c) **XCON**
 - d) HEARSAY
16. **If an expert system attempts to determine a possible disease based on a comprehensive set of a patient's reported symptoms, it is primarily utilizing:**

- a) Backward Chaining, as it starts with a suspected diagnosis.
 - b) **Forward Chaining, as it works from known facts to infer a conclusion.**
 - c) Goal-Driven Reasoning, by setting the disease as the initial goal.
 - d) Hypothetical reasoning, by creating multiple potential diagnoses.
17. **The "backstage control panel" where new rules or data are added or removed by experts and engineers is referred to as the:**
- a) User Interface
 - b) Explanation Facility
 - c) **Knowledge Acquisition Module**
 - d) Inference Engine
18. **What is the primary role of the Working Memory (or Fact Base) in an expert system?**
- a) To permanently store all facts and rules.
 - b) To explain the system's reasoning process.
 - c) **To temporarily store current facts during a reasoning session.**
 - d) To allow experts to update the system.
19. **A rule like "Fever is a body temp > 100.4°F" is an example of what type of knowledge within an expert system's knowledge base?**
- a) Procedural
 - b) Inferential
 - c) **Declarative**
 - d) Experiential
20. **One key distinction between conventional computer systems and expert systems, as highlighted, is that expert systems possess a:**
- a) Faster processing speed.
 - b) Larger data storage capacity.
 - c) **Knowledge Base and Inference Engine.**
 - d) More user-friendly interface.
21. **The concept of "Data-Driven Reasoning" is synonymous with which type of chaining?**
- a) Backward Chaining
 - b) **Forward Chaining**
 - c) Hypothetical Chaining
 - d) Iterative Chaining

22. **An expert system that relies heavily on rules like "IF condition A AND condition B THEN consequence C" and has difficulty adapting to new, unforeseen scenarios is illustrating which limitation?**
- a) Its inability to link to external databases.
 - b) Its struggle with unstructured data.
 - c) **Its reliance on manual rules and lack of learning capability.**
 - d) Its slow processing speed.
23. **Which of the following expert systems was known for predicting molecular structures using spectra data?**
- a) MYCIN
 - b) **DENDRAL**
 - c) XCON
 - d) HEARSAY
24. **In the WebMD symptom checker example, where users click checkboxes for symptoms and the system provides likely diagnoses, the symptom checker acts as a real-world example of which expert system component?**
- a) Inference Engine
 - b) Explanation Facility
 - c) **User Interface**
 - d) Knowledge Base
25. **The core idea of reasoning in expert systems is described as drawing conclusions from known facts and rules using logical steps, similar to how a human expert would "reason" through a case. This reasoning typically involves which two types?**
- a) Inductive and Deductive
 - b) Qualitative and Quantitative
 - c) **Forward and Backward Chaining**
 - d) Analytical and Intuitive
26. **If a legal expert system is designed to provide recommendations and then justifies its output by showing which laws and facts supported the given advice, it demonstrates the effectiveness of its:**
- a) Knowledge Base for storing legal statutes.
 - b) User Interface for inputting case details.

- c) **Explanation Facility for building trust and transparency.**
 - d) Working Memory for temporary fact storage.
27. **Expert systems are described as not being scalable to complex problems such as:**
- a) Diagnosing blood infections.
 - b) Configuring computer systems.
 - c) **Vision, language, or natural speech.**
 - d) Predicting molecular structures.
28. **What is the "Concept" for Backward Chaining?**
- a) Start with known facts and apply rules until a goal is reached.
 - b) **Start with a goal and look for rules that support it.**
 - c) Begin with external data and continuously update the knowledge base.
 - d) Always prioritize procedural knowledge over declarative knowledge.
29. **A characteristic that differentiates an Expert System from a conventional computer system is its ability to follow if-then rules to reach conclusions based on expert knowledge, rather than just performing programmed computations. This highlights the expert system's simulation of:**
- a) Data storage capacity.
 - b) **Human expert decision-making.**
 - c) Graphical user interface design.
 - d) Real-time data processing.
30. **What happens when an expert system's inference engine finds a rule whose conditions are all true during forward chaining?**
- a) It disregards the rule as irrelevant.
 - b) It immediately asks the user for more information.
 - c) **It fires the rule and adds the conclusion to the known facts.**
 - d) It switches to backward chaining.
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Ontologies

1. **An ontology is defined as a structured way to represent knowledge, including concepts, properties, and relationships. Which of the following characteristics is NOT explicitly listed as part of this definition?**
- a) Formal
 - b) Explicit

- c) Shared
 - d) **Flexible**
2. **What does it mean for an ontology to be "Explicit"?**
 - a) It can be easily updated by external systems.
 - b) **All terms and relationships are clearly defined.**
 - c) It allows for flexible interpretation of concepts.
 - d) It only contains general, undefined terms.
 3. **In the analogy of a Library Catalog (Dewey Decimal System) for ontologies, what do the categories like "Science," "History," and "Fiction" primarily represent?**
 - a) Instances of knowledge
 - b) Relationships between books
 - c) **Structured concepts or classes**
 - d) Explicit rules for searching
 4. **What does "Conceptualization" refer to in the context of an ontology?**
 - a) The process of sharing data across systems.
 - b) **How we view a specific part of the world.**
 - c) The ability to infer new facts automatically.
 - d) The formal structure and rules of the ontology.
 5. **In the family tree analogy, if "John" is an instance of a "Person," and "isParentOf" is a relationship, what would "Parent," "Child," and "Sibling" represent?**
 - a) Instances
 - b) Properties
 - c) **Classes**
 - d) Data points
 6. **One key reason why ontologies are useful in AI is that they help in reasoning. This means they can:**
 - a) Store vast amounts of unstructured data.
 - b) **Infer new facts from existing ones.**
 - c) Automatically learn and adapt over time.
 - d) Translate natural language into machine code.

7. **What is "semantic interoperability" in the context of ontologies?**
- a) The ability to operate without human intervention.
 - b) The ability to store data in a non-structured format.
 - c) **Making data sharable and understandable across different systems.**
 - d) The process of converting unstructured data into structured data.
8. **Which of the following is a recognized challenge of ontologies?**
- a) They are easily adaptable to unstructured data like text or images.
 - b) They require minimal effort to build and maintain.
 - c) **They are best for well-structured knowledge domains.**
 - d) They excel at capturing uncertainty and probabilistic relationships.
9. **The statement "You can infer that 'John's mother is Anna's mother' without it being explicitly stated" from the family tree analogy highlights which advantage of ontologies?**
- a) Their explicit nature.
 - b) Their ability to capture uncertainty.
 - c) **Their usefulness in reasoning.**
 - d) Their formal structure.
10. **Ontologies are generally NOT suitable for which type of data?**
- a) Anatomy knowledge
 - b) Curriculum structure
 - c) **Unstructured data like text, images, or audio**
 - d) Well-defined conceptual models
11. **Which characteristic describes an ontology that is "Agreed upon by a group of users or systems"?**
- a) Formal
 - b) Explicit
 - c) **Shared**
 - d) Conceptual
12. **If a machine uses an ontology, it doesn't just see words but "sees relationships and structure." This contributes to the ontology's ability to:**
- a) Reduce the need for human experts.
 - b) **Give meaning to data.**
 - c) Process data at higher speeds.
 - d) Store more data efficiently.

13. **The "Ontology Stack" is mentioned as a general reference to:**
- a) A specific software program for building ontologies.
 - b) **A hierarchical structure or framework of ontology components/layers.**
 - c) The challenges involved in ontology development.
 - d) A real-world application of ontologies in engineering.
14. **Why did AI techniques move "beyond Expert Systems and Ontologies"?**
- a) They were too expensive to implement.
 - b) **They struggled with unstructured, ambiguous, or noisy real-world data.**
 - c) They required too much computational power.
 - d) They were too flexible and scalable.
15. **Both Expert Systems and Ontologies are generally limited because they lack:**
- a) A user interface for interaction.
 - b) The ability to store facts and rules.
 - c) **Learning capability and don't improve with experience.**
 - d) Formal structures and explicit definitions.
16. **Expert systems are limited in flexibility and scalability, while ontologies require manual creation and don't adapt to changing data. This common drawback points to a general limitation of both in terms of:**
- a) Their ability to integrate with external systems.
 - b) Their inherent lack of human oversight.
 - c) **Their static nature and manual upkeep requirements.**
 - d) Their inability to represent simple facts.
17. **If an ontology is used to represent the relationships between different departments, job roles, and projects within an organization, this best exemplifies its use for:**
- a) Capturing uncertainty.
 - b) Dealing with unstructured data.
 - c) **Organizing well-structured conceptual knowledge.**
 - d) Automating decision-making without rules.
18. **What is a defining characteristic of "Formal" in the context of an ontology?**
- a) It is flexible and adaptable to various interpretations.
 - b) **It adheres to a specific structure and rules.**

- c) It is easy for non-experts to understand immediately.
 - d) It changes frequently based on new data.
19. **A researcher is building a system to understand complex social media sentiment, which involves highly ambiguous language and evolving slang. Based on the sources, why would an ontology likely be a poor choice for representing this type of knowledge?**
- a) Ontologies are too formal for social media.
 - b) **Ontologies are not suitable for unstructured data and limited in capturing uncertainty.**
 - c) Ontologies require too many domain experts for social media.
 - d) Ontologies cannot define relationships between words.
20. **The ability of ontologies to "give meaning to data" means that machines can:**
- a) Only process numerical data.
 - b) **Understand the context and relationships of data, not just raw words.**
 - c) Generate data on their own.
 - d) Store data without any structure.
21. **Consider a system designed to categorize medical conditions and their related symptoms, treatments, and affected body parts. To ensure consistent understanding and data sharing across different hospitals' IT systems, which AI concept would be most beneficial?**
- a) Expert System's Inference Engine
 - b) **Ontology for semantic interoperability**
 - c) Expert System's Working Memory
 - d) Forward Chaining reasoning
22. **The example of a family tree where "John's mother is Anna's mother" can be inferred, even if not explicitly stated, demonstrates an ontology's ability to facilitate:**
- a) Data storage.
 - b) **Reasoning.**
 - c) User interaction.
 - d) Real-time updates.
23. **One of the main challenges of ontologies is that they typically require what for their creation and maintenance?**

- a) Automated machine learning algorithms.
 - b) **Domain experts.**
 - c) Large datasets of unstructured text.
 - d) Minimal computational resources.
24. **The statement that ontologies "reflects how we view a part of the world" refers to their characteristic of:**
- a) Formality
 - b) Explicitness
 - c) **Conceptualization**
 - d) Shared understanding
25. **Why are ontologies generally "Limited in capturing uncertainty or probabilistic relationships"?**
- a) **They are designed for highly structured and explicitly defined knowledge.**
 - b) They only use formal logic.
 - c) They lack the capacity to store numerical data.
 - d) They cannot define relationships.
26. **If a global scientific research collaboration needs a standardized way to define terms, measurements, and relationships within a specific scientific field so that data and findings can be universally understood and exchanged, this need directly points to the utility of an ontology due to its characteristic of being:**
- a) Conceptualization and Formal.
 - b) Explicit and Flexible.
 - c) **Shared and Formal.**
 - d) Unstructured and Adaptable.
27. **The reason "Both [Expert Systems and Ontologies] lack learning capability — they don't improve with experience" contributed to the move towards:**
- a) More robust rule bases.
 - b) Improved explanation facilities.
 - c) **Modern AI techniques.**
 - d) Larger knowledge bases.
28. **What are "concepts (things), properties (features), and relationships between those concepts" the main elements used to represent knowledge**

in?

- a) A relational database.
- b) An expert system's working memory.
- c) **An ontology.**
- d) A conventional computer program.

29. **A library's Dewey Decimal System categorizes books and assigns codes, allowing users to find related subjects. This system's fundamental role in organizing knowledge for easy search and retrieval based on defined relationships perfectly illustrates an ontology's ability to:**

- a) Process real-time data efficiently.
- b) **Provide a formal structure for reasoning about relationships.**
- c) Automate the writing of new books.
- d) Store unstructured information.

30. **What term describes an ontology where "All terms and relationships are clearly defined"?**

- a) Formal
- b) **Explicit**
- c) Shared
- d) Conceptual