

6.8 Expert systems

Syllabus 2026 - 2028

WHAT YOU NEED TO KNOW

- Characteristics, uses and purpose of expert systems
- Components of an expert system: user interface, inference engine, knowledge base, rules base and explanation system
- How an expert system is used to produce possible solutions for different scenarios

What is an expert system?

An expert system is a computer program that copies the knowledge and decision making of a human expert. The user answers questions and the system gives advice, a diagnosis or a list of possible solutions.

- **Uses:** mineral prospecting, car engine fault diagnosis, medical diagnosis, chess games, financial planning, route scheduling for delivery vehicles, plant and animal identification

Components

Component	Purpose
User interface	How the user communicates with the system: it asks questions, accepts answers and shows the results.
Knowledge base	A database of facts and expert knowledge about the subject.
Rules base	A set of rules, usually written as IF ... THEN statements, used to reach a conclusion from the facts.
Inference engine	The software that does the reasoning. It uses the rules to search the knowledge base and works out the answer.
Explanation system	Shows the user how the conclusion was reached and which rules were used.

How an expert system produces solutions

- The user enters answers to questions asked through the user interface
- The inference engine matches the answers with the rules base and the knowledge base
- It works out one or more possible solutions, often with a level of probability
- The result is displayed, and the explanation system can show how it was reached
- Different answers in different scenarios lead to different results

Advantages	Disadvantages
+ Gives expert advice anywhere and at any time, even where no expert is available	- Expensive and time-consuming to build, because experts must be interviewed
+ Cheaper than paying a human expert	- Only knows what is in the knowledge base and rules base
+ Fast, consistent and able to use a very large amount of knowledge	- Lacks human common sense, intuition and creativity
	- Needs regular updating, and wrong input gives wrong advice

EXAM TIP

Learn the five components by name and be ready to explain each one in a sentence. A common question asks you to describe the job of the inference engine or the rules base.

Key terms

Term	Meaning
Knowledge base	The facts and information about a subject stored in the system.
Rules base	The IF ... THEN rules used to make decisions.
Inference engine	The part that reasons, using the rules and the knowledge base.
Explanation system	The part that shows how an answer was reached.