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COMPUTER ENGINEERING

Electronics Instrumentation (Digital) EEE 471

Question 2

Explain briefly the expert system instrumentation

Expert systems have been applied for the control of [bioprocesses](https://www.sciencedirect.com/topics/engineering/bioprocesses) to provide a means of imitating the decisions made by a skilled operator. An expert system is an example of a knowledge-based system. Expert systems were the first commercial systems to use a knowledge-based architecture. A knowledge-based system is essentially composed of two sub-systems: the knowledge base and the inference engine. It is widely used in many areas such as medical diagnosis, accounting, coding, games etc. An expert system is an AI software that uses knowledge stored in a knowledge base to solve problems that would usually require a human expert thus preserving a human expert's knowledge in its knowledge base. Expert systems for other purposes of application in the pharmaceutical formulations have also been developed, for example, expert systems for formulation of parenteral drugs are available and can be used to calculate various parameters required to ensure the proper formulation and can be used for parenteral administration. An expert system generally consists of four components: a knowledge base, the search or inference system, a knowledge acquisition system, and the user interface or communication system.

The different types of expert systems are:

* Knowledge Base.
* Inference Engine.
* Knowledge acquisition and learning module.
* User Interface.
* Explanation module.

### Advantages

Expert Systems can:

1. Provide answers for decisions, processes and tasks that are repetitive
2. Hold huge amounts of information
3. Minimize employee training costs
4. Centralize the decision making process
5. Make things more efficient by reducing the time needed to solve problems
6. Combine various human expert intelligences
7. Reduce the number of human errors
8. Provide strategic and comparative advantages that may create problems for competitors
9. Look over transactions that human experts may not think of

### Disadvantages

1. No common sense used in making decisions
2. Lack of creative responses that human experts are capable of
3. Not capable of explaining the logic and reasoning behind a decision
4. It is not easy to automate complex processes
5. There is no flexibility and ability to adapt to changing environments
6. Not able to recognize when there is no answer

QUESTION 1

Explain briefly the signal processing and interfacing techniques in measuring instruments

Signal processing is an [electrical engineering](https://en.wikipedia.org/wiki/Electrical_engineering) subfield that focuses on analyzing, modifying, and synthesizing [signals](https://en.wikipedia.org/wiki/Signal) such as [sound](https://en.wikipedia.org/wiki/Audio_signal_processing), [images](https://en.wikipedia.org/wiki/Image_processing), and scientific measurements. Signal processing techniques can be used to improve transmission, storage efficiency and subjective quality and to also emphasize or detect components of interest in a measured signal. An interfacing technique or input technique is a combination of [hardware](https://en.wikipedia.org/wiki/Computer_hardware) and [software](https://en.wikipedia.org/wiki/Software) elements that provides a way for computer users to accomplish a single task. For example, one can go back to the previously visited page on a Web browser by either [clicking](https://en.wikipedia.org/wiki/Point-and-click) a [button](https://en.wikipedia.org/wiki/Button_(computing)), pressing a [key](https://en.wikipedia.org/wiki/Computer_keyboard_keys), performing a [mouse gesture](https://en.wikipedia.org/wiki/Mouse_gesture) or uttering a [speech command](https://en.wikipedia.org/wiki/Hands-free_computing). It is a widely used term in [human-computer interaction](https://en.wikipedia.org/wiki/Human-computer_interaction). An interfacing technique is a way of using a physical input/output device to perform a generic task in a human-computer dialogue.

An interfacing technique is the fusion of input and output, consisting of all software and hardware elements, that provides a way for the user to accomplish a task.