Question number 1

Expert systems can be distinguished from conventional computer systems in that:

1. They simulate human reasoning about the problem domain, rather than simulating the domain itself. 2. They perform reasoning over representations of human knowledge, in addition to doing numerical calculations or data retrieval. They have corresponding distinct modules referred to as the inference engine and the knowledge base.

3. Problems tend to be solved using heuristics (rules of thumb) or approximate methods or probabilistic methods which, unlike algorithmic solutions, are not guaranteed to result in a correct or optimal solution.

4. They usually have to provide explanations and justifications of their solutions or recommendations in order to convince the user that their reasoning is correct. Note that the term Intelligent Knowledge Based System (IKBS) is sometimes used as a synonym for Expert System

Ref: <http://www.cs.bham.ac.uk/~jxb/IAI/w9.pdf>

Question number 2

Knowledge acquisition: gathering of expert domain knowledge.

Usually involves interviewing and observing one or more human

experts.

**Knowledge engineer**

The knowledge engineer has the task of obtaining the domain

knowledge from the human expert and representing it in a suitable form

so that it can be entered into an expert system shell. This process is

called *knowledge acquisition* and *elicitation*

**Knowledge acquisition and elicitation**

Knowledge acquisition (or elicitation) is the process of gathering

together the domain knowledge required for the expert system’s

knowledge base. This knowledge may come from books, magazines,

web-sites, CD-ROM reference materials or a human expert.

When information is obtained from books, magazines, web-sites and CDROM

reference materials, it is called *knowledge acquisition*.

When information is obtained from a human expert, it is called

*knowledge elicitation*.

(d) Outline some of the main technical problems one has to overcome when attempting to build a successful Expert System for a new domain. Question 2 Some common problems that can occur when building expert systems are: 1.

The expert’s knowledge base and the inference engine algorithms get inextricably entwined, and it becomes impossible to update one without introducing problems into the other.

2. Having spent months extracting and representing rules from an expert, the knowledge base is still seriously incomplete and cannot solve even the simplest problems.

3. The expert has given us so many rules that the operation of the system has become unacceptably slow.

4. The knowledge acquisition process has taken much longer than we expected, and now our expert refuses to work with us any more.

5. Having got our expert system to perform well, it is now proving impossible to figure out how it is coming up with its outputs. For each, suggest how we could minimize the chances of them happening, and how we should proceed if they do occur.

Qn4

Define the ES development environment and contrast it with the consultation environment. The development environment includes the activities and support that are necessary to acquire and represent the knowledge as well as to make inferences and provide explanations. The major players in this environment are the knowledge engineer and the domain expert who act as builders. Once the system is completed it is used for consultation by the nonexpert user via the consultation environment.

Qn 5

List and define the major components of an ES. \

The major components are:

\* Knowledge base--the software that represents the knowledge.

\* Inference engine--the reasoning mechanism.

\* User interface--the hardware and software that provide the dialogue between people and the computer.

Domain expert--the individual who is considered an expert.

• Knowledge engineer--the individual who acquires and represents the knowledge

.• Explanation facility--the software that answers questions such as "Why" and “How."

• Blackboard--a workplace for storing and working on intermediate information.

• Reasoning improvement--a facility (not available commercially) for improving the

• reasoning capabilities of an ES. User--the non-expert who uses the machine for consultation.

• Hardware--the hardware that is needed to support the ES.