CIS319: Decision Support and Executive Information Systems

EXAMPLE QUESTIONS FOR THE CIS319 EXAM

IMPORTANT: These are examples of the types of questions that might appear in the exam. The revision lecture notes provides other examples of likely exam questions. Note that these examples are not an indication of the topics of the exam questions. Anything said in the lecture and tutorials or written in the lecture notes may be in the exam.

1. You need to travel from London to Edinburgh in the shortest time possible. There are two possibilities:
- Take the train from Kings Cross. This takes 4 hours and leaves you in the centre of Edinburgh. The probability of it having a one hour delay is of 20%.
- Take a train from London to Stansted Airport, then take the plane to Edinburgh, and a taxi to the centre of Edinburgh. If everything is on time, the trip takes 3 hours, but there is a probability of 5% of missing the plane and having to wait two hours for the next one; and 10% that the taxi will take 30 minutes more because of a traffic jam.

a)
- i. Build an influence diagram for this decision.
- ii. Is this a sequential decision? Justify your answer.

b)
- i. Build a decision tree for this decision.
- ii. Indicate in the tree the travelling time for each outcome.
- iii. Indicate in the tree the probability of each outcome.

c) Indicate the expected time for each option (you do not need to do the arithmetic).

d)
- i. Consider the best and worst outcomes, and use them to compare the two options by their risk.
- ii. Assume that the expected time taking the train is about 40 minutes longer that with the plane option. If you are a very frequent traveller, which option is better? Why?

e) Bayes theorem can be expressed as P[A, B] = P[A] P[B | A]. Assume that A is "Railways are having trouble" and B is "The train to Edinburgh is delayed"
- i. What does P[A] mean?
- ii. What does P[A,B] mean?
- iii. What does P[B | A] mean?

2. Consider a system that diagnoses car problems. The system asks the user for information about the car and its symptoms, and then proceeds to suggest or indicate the source of the problems.

a) Describe the likely components and working of the diagnostic system if it is:
- i. an expert system with rule-based reasoning
- ii. an expert system with model-based reasoning
- iii. an expert system with case-based reasoning

b) Use the car diagnostic system as an example to explain what each component of a DSS does:

i. The data base
ii. The model base
iii. The knowledge base
iv. The user interface

c) Assume that the system uses the theory of certainty factors. Part of the diagnostic the system provides is that "the battery needs to be replaced" with a certainty factor of 1.

i. What would this mean?
ii. What would a certainty factor of 0 mean in this case?
iii. What would a certainty factor of –0.5 mean in this case?

3. An engineering firm uses a scheduling program to prepare projects. This system obtains information from the project managers, deciding which questions to ask by using a rule-based system. It uses then an extensive Markov decision model to produce the schedule. The information includes deliverables, tasks, task times and delay risk. The resulting schedule is a satisficing solution obtained using a set of rules to extract the information from the Markov model. The system suggests previous plans that could be used as a basis for the current plan.

a) In this case, which aspects are handled in:

i. The data base
ii. The model base
iii. The knowledge base

b) The states in this Markov decision model refer to the production of deliverables. The objective of the model is to complete the project in the shortest time possible, and the uncertainty in the model indicates delays.

i. In this case, the risk is of delays. What are the two components of this risk? Explain them.
ii. When would decision trees NOT be appropriate to represent this Markov decision model?

c) In this case, the Markov decision model is producing a satisficing solution.

i. What is the difference between optimisation and satisficing
ii. In which cases would you satisfise rather than optimise?

d)

i. How do you use a large number of observations to calculate a probability?
ii. Describe a technique that could be used to estimate probabilities when a large number of observations is unavailable. Use the project planning model as an example.

e)

i. In the context of decision making, what is sensitivity?
ii. How would you measure the sensitivity? (You may use the planning model as an example).