Two hours

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Management Support Systems

Date: Wednesday 28th May 2008
Time: 14:00 – 16:00

Please answer any THREE Questions from the FIVE questions provided

This is a CLOSED book examination

The use of electronic calculators is permitted provided they are not programmable and do not store text.
1. a) Define the main phases of a decision making process, according to Simon’s model. Provide a conceptual picture of the decision making and modelling process and describe briefly the main activities during the first two phases. (10 marks)

b) Furniture Manufacturing Company produces tables and benches. The company realises a profit contribution of £20 on each table and £24 on each bench. The demand for these products is strong. Each item must be produced in both the Assembly Department and the Finishing Department. Each table requires three hours of processing in the Assembly Department and four hours in the Finishing Department. Each bench requires six hours of processing in the Assembly Department and two hours in the Finishing Department. The Assembly Department can handle no more than 60 hours of work each day. The Finishing Department can handle only up to 32 hours of work daily. How could the company select the best combination of products in order to maximise the profit? Formulate the problem as a linear program and solve it graphically. What is the optimal profit? (10 marks)

2. a) List and explain the main steps of the Analytic Hierarchy Process (AHP). Analyse the main advantages of the AHP and its applicability for the development of Decision Support Systems. (15 marks)

b) You are given an Expert System with the following rules:

R1: IF interest rates fall THEN bond prices will increase.
R2: IF interest rates increase THEN bond prices will decline.
R3: IF interest rates are unchanged THEN bond prices will remain unchanged.
R4: IF the pound rises against the dollar THEN interest rates will fall.
R5: IF the pound falls against the dollar THEN interest rates will increase.
R6: IF bond prices decline THEN buy bonds ELSE do not buy bonds.

i) A client has just observed that the pound exchange rate is falling. He wants to know whether to buy bonds. Run a forward and a backward chaining and give him a recommendation.

ii) A second client has observed that interest rates are unchanged. She asks for advice on investing in bonds. Use forward chaining and give her a recommendation. (5 marks)
3. a) Describe the elements of general decision-making model for decision analysis. (8 marks)

b) Briefly describe the main steps in conducting a decision analysis? (6 marks)

c) Everyone would like to make a great deal of money in the stock market, but only a few are very successful. Are the Artificial Neural Networks a promising approach in this area? What can they do that other intelligent decision support technologies cannot do? (6 marks)

4. a) Describe the primary operations of Genetic Algorithms (GAs) and provide a flow diagram of the GAs process. (10 marks)

b) Compare and contrast rule-based and case-based reasoning. Which applications are most suitable for each one of those reasoning methods? (6 marks)

c) A simple Expert System contains the following rules and corresponding certainty factors (CF):

R1: IF you study hard THEN you will receive a first class mark in this exam (CF=0.8)
R2: IF you understand the material THEN you will receive a first class mark in this exam (CF=0.7)
R3: IF you are very smart THEN you will receive a first class mark in this exam (CF=0.6)

i) What is the certainty of getting a first class in this exam if you study hard and understand the material? (4 marks)

ii) What is the certainty of getting a first class in this exam if all premises of the rules are true? (4 marks)
5. a) Describe the learning process in Artificial Neural Networks and classify the learning algorithms. What are the main steps of the back-propagation algorithm? (10 marks)

b) John Smith, who is financial analyst at Stockbroker Ltd., has just bought a new house in Manchester for £200,000. He has financed this property by a mortgage loan of £100,000 by Halifax, and by a loan from his employer of £50,000. John is 40 years old and is married to Susan. They have three children who are five, eight, and fourteen years old. The house has a beautiful garden, four bedrooms and a garage.

i) Make a formal representation of this description using a semantic net.

ii) Represent John Smith and the house by an O-A-V triplet.

iii) Analyse the applicability of those two representation methods for the development of Intelligent Decision Support Systems. (10 marks)