UNIVERSITY OF LONDON

IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1996

BEng Honours Degree in Computing Part III
BSc Honours Degree in Mathematics and Computer Science Part III
MSc Degree in Computing Science
for Internal Students of the Imperial College of Science, Technology and Medicine

This paper is also taken for the relevant examinations for the
Diploma of Membership of Imperial College
Associateship of the City and Guilds of London Institute
Associateship of the Royal College of Science

PAPER 3.44

DECISION SUPPORT SYSTEMS

Friday, May 10th 1996, 10.00 - 12.00

Answer THREE questions

For admin. only: paper contains
4 questions
3 pages (excluding cover page)

1 The managers of the Sudso Corporation are considering the national launch of a new washing powder. The potential average sales of the product during its lifetime are classified as being either high, medium or low, and the net present value of the product under each of these conditions is estimated to be £80 million, £15 million and -£40 million, respectively. The company's marketing manager estimates that there is a 0.3 probability that average sales will be high, a 0.4 probability that they will be medium and a 0.3 probability that they will be low. It can be assumed that the company's objective is to maximize expected net present value.

On the basis of the marketing manager's prior probabilities, determine:

a whether the product should be launched;

b the expected value of perfect information.

The managers have another option. Rather than going immediately for a full national launch they could first test market the product in the Welsh sales area. This would obviously delay the national launch, and this delay, together with other outlays associated with the test marketing, would lead to costs having a net present value of £3 million. The test marketing would give an indication as to the likely success of the national launch. The reliability of each of the possible indications which could result is shown by the conditional probabilities in the table below (e.g., if the market for the product is such that high sales could be achieved there is a probability of 0.15 that test marketing would in fact indicate only medium sales):

	Test marketing indication		
Actual national sales	High national sales	Medium national sales	Low national sales
High	0.80	0.15	0.05
Medium	0.25	0.60	0.15
Low	0.10	0.30	0.60

c Calculate the expected value of imperfect information and hence determine whether Sudso should test market the product.

The three parts carry, respectively, 30%, 20%, 50% of the marks.

Turn over ...

2 A railway company is planning to purchase a new locomotive for one of its busiest lines, and one of two types of vehicle, the Arrow or the Bullet, is to be purchased. The prices of the two locomotives are very similar, so the choice is to be based on two factors: runing costs and reliability. It is agreed that these two factors can be represented by the variables: average weekly operating costs and number of breakdowns in the first three months of operation. The company's operations manager estimates that the following probability distributions apply to the two locomotives. It can be assumed that the probability distributions for operating costs and number of breakdowns are independent.

Arrow

Average weekly operating costs (£)	Prob.	No. of breakdowns	Prob.
20,000	0.6	0	0.15
30,000	0.4	1	0.85

Bullet

Average weekly operating costs (£)	Prob.	No. of breakdowns	Prob.
15,000	0.5	0	0.2
35,000	0.5	1	0.7
		2	0.1

Details of the manager's utility functions for operating costs and numbers of breakdowns are shown below:

Average weekly operating costs (£)	Utility	No. of breakdowns	Utility
15,000	1.0	0	1.0
20,000	0.8	1	0.9
30,000	0.3	2	0
35,000	0		

a The operations manager's responses to questions reveal that, for him, the two attributes are mutually utility independent. Explain what this means.

b The production manager also indicates that for him weights $k_1 = 0.7$ and $k_2 = 0.5$ (where attribute 1 is operating costs and attribute 2 is number of breakdowns). Discuss how these values could have been determined.

c Which locomotive has the highest expected utility for the operations manager?

The three parts carry, respectively, 30%, 30%, 40% of the marks.

Turn over ...

3 A large oil company that has outsourced most of its IT activity is unable to meet the high demand for small-scale specialized decision support tools. With a PC on everyone's desk and the availability of inexpensive and friendly development software, the company is keen to investigate the feasibility of encouraging end-user developed DSS. As senior IT consultant, you have been asked to write a report.

a Describe the advantages of users building their own DSS.

b Describe the risks.

c Suggest some quality-control approaches and tactics to reduce these risks and enhance the quality of user-developed DSS.

d Suggest an organizational innovation that could foster the successful development of user-defined DSS.

The four parts carry, respectively, 25%, 20%, 30%, 25% of the marks.

4a Describe the architecture of a typical modern large-scale decision support system.

b What is on-line analytical processing (OLAP), and how does it differ from on-line transaction processing (OLTP)?

c Why is it generally thought a good idea to have a separate database serving OLAP, rather than attempting to send to all analytical queries direct to the operational databases?

d If a company were to use a relational database for OLAP purposes, how might they organize it?

The four parts each carry 25% of the marks.

End of paper