DECISION MATHEMATICS 2, D2 (4772) A2

Objectives

To give students experience of modelling and of the use of algorithms in a variety of situations.

To develop modelling skills.

The problems presented are diverse and require flexibility of approach. Students are expected to consider the success of their modelling, and to appreciate the limitations of their solutions.

Assessment

Examination (72 marks)
1 hour 30 minutes
The examination paper has two sections:

Section A: two questions, each worth about 12 marks
Section Total: 24 marks

Section B: two questions each worth about 24 marks
Section Total: 48 marks

Assumed Knowledge

Candidates are expected to know the content of *C1* and *C2* and *D1*.

Calculators

In the MEI Structured Mathematics specification, no calculator is allowed in the examination for *C1*. For all other units, including this one, a graphical calculator is allowed.

DECISION MATHEMATICS 2, D2		
Specification	**Ref.**	**Competence Statements**
LINEAR PROGRAMMING		
The simplex algorithm.	D2L1	Be able to solve simple maximisation problems with ≤ constraints and with two or more variables.
Geometric interpretation.	2	Be able to identify tableaux (initial, intermediate and final) with feasible points, particularly in the case of problems involving two or three variables.
≥ inequalities.	3	Know and be able to apply the two stage simplex, and of the big M methods to construct an initial feasible solution to problems involving ≥ constraints.
Equality constraints.	4	Understand how to model an equality constraint by using a pair of inequality constraints.
Problem solving.	5	Be able to formulate, solve and interpret the solutions of a variety of problems as linear programming problems, and be able to interpret the solutions.
NETWORKS		
The shortest path between any two nodes in a connected Network.	D2N1	Know and be able to apply Dijkstra's algorithm repeatedly.
	2	Know and be able to apply Floyd's algorithm.
	3	Be able to analyse the complexity of Dijkstra's and Floyd's algorithms.
The travelling salesperson problem (TSP).	4	Be able to convert the practical problem into the classical problem.
	5	Be able to interpret a solution to the classical problem in terms of a solution to an underlying practical problem.
	6	Be able to analyse the complexity of complete enumeration.
	7	Be able to construct an upper bound for the solution to the classical problem.
	8	Be able to construct a lower bound for the solution to the classical problem.
The route inspection (Chinese postperson) problem (CPP).	9	Know and be able to apply the route inspection algorithm.
	10	Be able to analyse the complexity of the algorithm.

DECISION MATHEMATICS 2, D2		
Specification	**Ref.**	**Competence Statements**
LOGIC		
Propositions and connectivity.	D2p1	Know and understand how to form compound propositions by using ~, $\wedge$, $\vee$, $\Leftrightarrow$ and $\Rightarrow$.
	2	Be able to use truth tables to analyse propositions.
Switching and combinatorial circuits.	3	Be able to model compound propositions with simple switching and combinatorial circuits.
Boolean algebra.	4	Be able to manipulate Boolean expressions involving $\sim$, $\wedge$ and $\vee$ using the distributive laws, de Morgan's law, etc.
DECISION TREES		
Using networks in decision analysis.	D2N1	Be able to construct and interpret simple decision trees.
	2	Be able to use expected monetary values (EMVs) to compare alternatives.
	3	Be able to use utility to compare alternatives.