Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin

Faculty of Engineering, Mathematics and Science

School of Computer Science & Statistics

Management Science and Information Systems Studies   Trinity term 2016
Senior Sophister

Management Science in Practice

Wednesday 4th May 2016   RDS   14:00-17:00

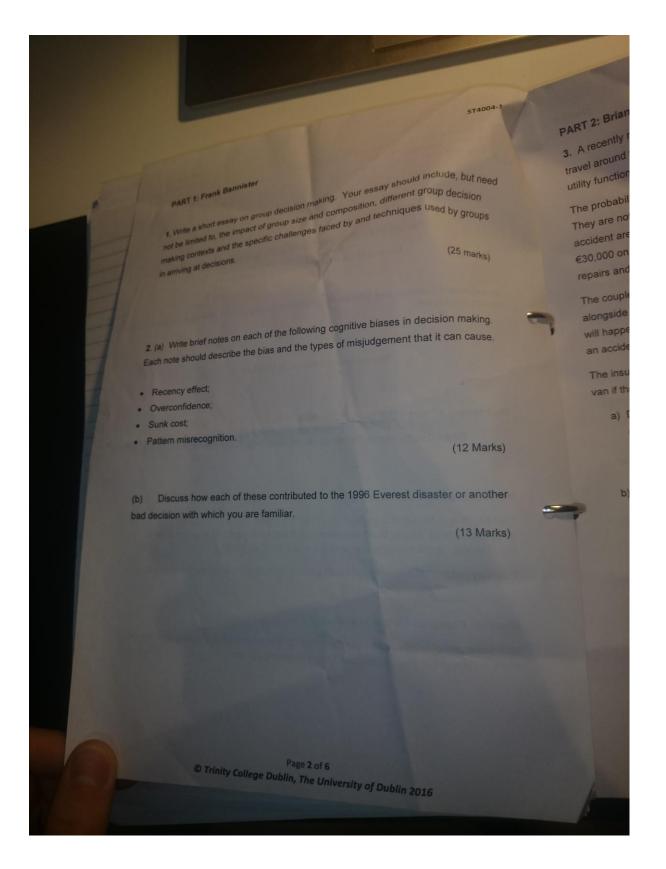Brian Reddy, Frank Bannister, Brett Houlding, Sally Brailsford

Instructions to Candidates:

This paper is made up of 3 parts, each of two questions. You must attempt **four** questions in total, with **at least one question from each part**. All questions carry equal marks. Each question is scored out of a total of 25 marks.

You may not start this examination until you are instructed to do so by the invigilator.

Materials Permitted for this examination:

Non-programmable calculators are permitted for this examination – please indicate the make and model of your calculator on each answer book used.

PART 1: Frank Bannister

1. Write a short essay on group decision making. Your essay should include, but need not be limited to, the impact of group size and composition, different group decision making contexts and the specific challenges faced by and techniques used by groups in arriving at decisions.

(25 marks)

2. (a) Write brief notes on each of the following cognitive biases in decision making. Each note should describe the bias and the types of misjudgement that it can cause.

- Recency effect;
- Overconfidence;
- Sunk cost;
- Pattern misrecognition.

(12 Marks)

(b)   Discuss how each of these contributed to the 1996 Everest disaster or another bad decision with which you are familiar.

(13 Marks)

PART 2: Brian

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PART 2: Brian Reddy

3. A recently retired couple have bought a large campervan for €250,000 and plan to travel around the world for the year. Their total net worth is 2 million euro and their utility function can be described by the function: $U(x) = 1 - e^{-x/1,000,000}$.

The probability of the van being stolen and destroyed (leaving it worthless) is 1/20. They are not particularly safe drivers and their chances of being responsible for an accident are about 1/5. They estimate that if this happens, they will have to spend €30,000 on repairs for the other vehicle involved, their own van will require €50,000 of repairs and that its value will be permanently reduced by €20,000.

The couple are considering whether or not to get insurance. Assume for simplicity that alongside these two outcomes, the only other outcome possible is that neither event will happen (i.e. they cannot be in an accident more than once, and they cannot be in an accident *and* have their van stolen).

The insurance company will not pay out any money for reductions in the value of the van if they are in an accident, but would cover all other costs.

a) Draw the decision table summarising the available actions, states of nature and consequences.
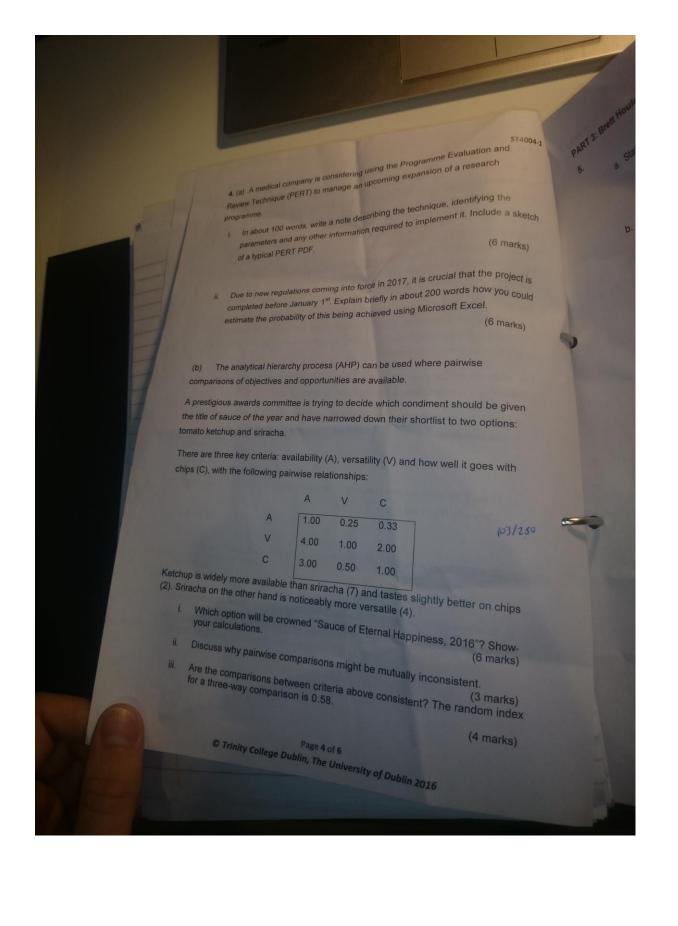
(10 marks)

b) Given their utility function, would they be willing to pay €30,000 for insurance? Show why this is the case.

(4 marks)

c) Describe what is meant by the terms "probability premium" and "risk premium".

(6 marks)

d) Briefly describe (in about 50 words) a method by which the utility associated with an outcome for a given individual can be estimated.

(5 marks)

4. (a) A medical company is considering using the Programme Evaluation and Review Technique (PERT) to manage an upcoming expansion of a research programme.

i. In about 100 words, write a note describing the technique, identifying the parameters and any other information required to implement it. Include a sketch of a typical PERT PDF.

(6 marks)

ii. Due to new regulations coming into force in 2017, it is crucial that the project is completed before January 1st. Explain briefly in about 200 words how you could estimate the probability of this being achieved using Microsoft Excel.

(6 marks)

(b) The analytical hierarchy process (AHP) can be used where pairwise comparisons of objectives and opportunities are available.

A prestigious awards committee is trying to decide which condiment should be given the title of sauce of the year and have narrowed down their shortlist to two options: tomato ketchup and sriracha.

There are three key criteria: availability (A), versatility (V) and how well it goes with chips (C), with the following pairwise relationships:

	A	V	C
A	1.00	0.25	0.33
V	4.00	1.00	2.00
C	3.00	0.50	1.00

Ketchup is widely more available than sriracha (7) and tastes slightly better on chips (2). Sriracha on the other hand is noticeably more versatile (4).

i. Which option will be crowned "Sauce of Eternal Happiness, 2016"? Show your calculations.

(6 marks)

ii. Discuss why pairwise comparisons might be mutually inconsistent.

(3 marks)

iii. Are the comparisons between criteria above consistent? The random index for a three-way comparison is 0.58.

(4 marks)

PART 3: Brett Houlding

5.

  a. State the minimax theorem for two-person zero-sum games.

  (5 marks)

  b. In a particular zero-sum game, R chooses row 1, 2 or 3, and C chooses column 1, 2, 3 or 4. The table of pay-offs to R is as follows:

C:	C1	C2	C3	C4
R: R1	3	2	5	7
R2	1	6	0	8
R3	2	0	4	6

  Identify the value of the game and the optimal strategies of the players.

  (20 marks)

6.

a. Consider a feasible region S and a status quo point (u_S^*, v_S^*). State the definition of the Nash point.

(5 marks)

b. A couple, John and Mary, want to buy a car. They selected 4 brands acceptable for both and have an additional option not to buy if they cannot come to an agreement. They decided to use bargaining theory to agree on a brand. Their utilities are:

	Brand 1	Brand 2	Brand 3	Brand 4	No Purchase
John	1	2	4	1	0
Mary	2	1	1	3	0

Derive the Nash point for this bargaining problem and the strategy for which this bargain is attained.

(20 marks)

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