EXAMINER'S REPORT

MAY 2006

LOGISTICS MANAGEMENT

General Comments

Generally the results were quite good this year although there were very few "As", and two very high results, 82% and 86%. Generally the case and the theory were done well while the quantitative questions were not done well. Once again I will focus on these aspects in this report. However, there were a significant number who did not make an effort on the case.

The quantitative sections contain relatively predictable applications that follow set rules. The linear programming question caused the most problems. It is difficult, but it is a great teaching device for giving a true understanding of profit constrained by resource limits.

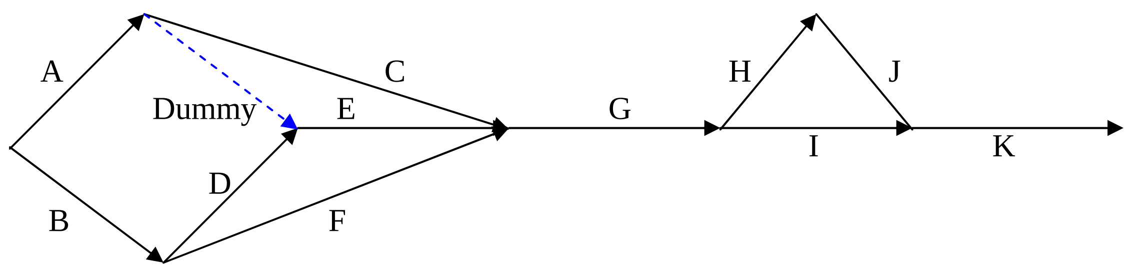
The way this course and exam is structured requires one to really get into the theory, the techniques and how to apply the ideas in practice. This follows a learning cycle. Ideally people should look at the cases early on to get an idea of the types of problems which occur. These are mixtures of marketing, logistics, mathematics and strategy. Subsequently one should get into the theory, but not spend the year learning it off. Usually it is reasonably well done. Basically I expect a clear understanding of what is in the text and some practical illustrations from outside, such as from Irish applications. The middle part of the year should be spent on the quantitative techniques, hopefully linking them into the cases and the theory, and anecdotes about Irish companies where possible.

Some people got through by getting full marks for one of the quantitative questions and getting by on the others. People who failed invariably did one of the sections very poorly and were not able to compensate from another section. It is safer to prepare all the sections. Some of the people who failed narrowly, with an E grade reflecting 35% to 39%, did not do a question from either of the two quantitative sections.

The case questions are geared at bringing one through a process of analysis, evaluation, diagnosis and prognosis. Most people tried all parts of the case section, and attempted all the sections. Consequently there were fewer than ever failures due to not attempting one or more sections. In the past this was the most common cause of failure and the reason for the high average failure rate. One of the problems with the case seems to be that it was done last, which is justifiable, but without being given enough time. It does account for 40%, i.e. it is equivalent to two of the other questions. It should be understood that logistics is important not just of itself but also because it requires one to put on one's quantitative thinking cap when addressing marketing problems. Some people did no quantitative evaluation in the case, which was regrettable. Generally most people seemed to have been better prepared for the case than previously.

QUANTITATIVE QUESTIONS
Firstly, before I get into specifics, I would like to emphasise that there is no need to do roughwork and then write your answer out neatly. It wastes your precious time. Do the question as best you can. If you think you are making a mistake say so, and try to correct the mistake. If you blank out, just leave two pages so that you can move onto other questions. Maybe later you will be able to do the rest of that question. Do not waste your time doing restarts.

The idea of having two different quantitative sections is to separate the less standard from the standard, the unstructured from the straightforward application of algorithms. The **Project Evaluation Review Technique (PERT)** question is an example of a standard application of an algorithm that many people got mainly right. This is a cut-down version of a linear programming problem.
Some people had difficulty with drawing the network. The following is the correct one.



The difficulty arose with the use of dummy activities. Some people added in dummy activities all over the place. There is nothing wrong with doing that, but please redraw the network afterwards so that you can get rid of the dummy activities where possible. Very few people can draw a network correctly the first time. The other extreme was not using a dummy where one should, as in the diagram above. It is easy to check that a network is correct. Just check the precedences at each node with the table.

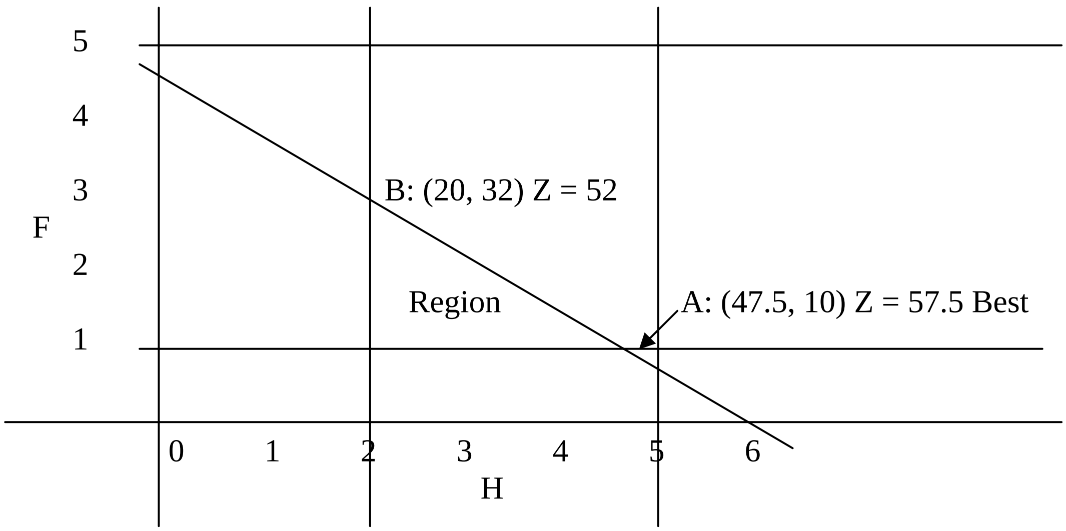
Most people who did this question and got the dummy right also found the critical path B-D-E-G-H-J-K and the expected duration of 44 days. Very few got the standard deviation of the expected duration. This is got by the rule that the variance of the sum equals the sum of the variances of the times on the critical path, which in this case was 9. So the standard deviation was 3.

Most people missed the last part of this question. The Z-score for 50 days is (50 – 44) / 3 = 2. In tables for areas under the Standard Normal Curve for Z = 2 the area beyond 50 days is 0.0228 or 2.28%. The assumption was that the time variabilities *for each activity* follow a normal distribution pattern.

The linear programme was badly done. This is an important topic and is likely to continue to appear on exams. The problems started with misreading the problem. It is assumed that a run in one is as good as in the other. Some people made the cost function the objective. No more than 50 runs in either magazine does not mean no more than 50 runs between both combined.

The following is a summary of the solution.

Maximise Profit =	H	+	F		
Subject to:					
	4 H	+	5 F	< =	240
	H	+		> =	20
			F	> =	10
	H	+		< =	50
			F	< =	50
	H >= 0		F > = 0		



(a) Currently Point A: (47.5, 10) Z = 57.5 is the best then B: (20, 32) Z = 52.

(b) If the budget was increased or decreased by 40,000 the B solution moves between (20, 24) giving 44 profit and (20, 40) giving 60 profit. Likewise the A solution moves between (37.5, 10) giving 47.5 profit and (50, 16) giving 66 profit, which is the best. This uses the maximum of H (Irish Health) and whatever is left to F (Irish Fitness monthly).

(c) This asks what if H became more profitable?
The solution is already at maximum H. Consequently it has no effect.

Section C contained a **simulation** question. I include this kind of question occasionally because, whenever there is no obvious model, the rule is that you simulate.
Not many got it fully right. The following is the answer.

The interarrival-time probability distribution is given below. The third line contains the corresponding intervals that are used for the simulation of inter-arrival times.

IAT (seconds)	20	30	40	50	60	70	80
Probability	0.07	0.14	0.26	0.22	0.16	0.10	0.05
Intervals	00-06	07-20	21-46	47-68	69-84	85-94	95-99

You were required to use simulate 11 inter-arrival times between 12 customers.
The catch here was that the first arrival time was zero. Quite a significant number of people missed the point that these are times *between the arrival* of the first person and the second, the second and the third, and so on.

0 30 70 60 40 80 30 70 40 60 30 50

The probability distribution of the time it takes to be served is given below. The third line contains the corresponding intervals that are used for the simulation of service times.

Service Time (seconds)	20	30	40	50	60	70	80
PROBABILITY	0.08	0.17	0.28	0.20	0.14	0.09	0.04
INTERVALS	00-07	08-24	25-52	53-72	73-86	87-95	96-99

We next simulate 12 customers' service times.

20 30 20 50 60 40 60 40 50 50 70 30.

The most important thing is to organise your table well. The easiest way is by customer.

Cust.	1	2	3	4	5	6	7	8	9	10	11	12
Arrive	0	30	100	160	200	280	310	380	420	480	510	560
Service	0	30	100	160	**210**	280	**320**	380	420	480	**530**	**600**
Delay	0	0	0	0	10	0	10	0	0	0	20	40

Here Service stands for total service start times.
The first delay occurs when the fourth customer takes 50 seconds and the fifth customer arrives after 40 seconds.
The time in service is 600 seconds plus 80 queueing or 94 minutes, averaged over 12 customers gives 50 and 6.7 seconds respectively.

The other Section C question was on **stock (inventory) control**.
This is a long section in the text and likely to occur every year.

Most people got the economic order quantity of 185 units, but few got the re-order level of 75 units. Many got the total cost of 12,259.20.

Strangely, people either got the longer Part (c) fully right or fully wrong. For order quantity of 500 it involved an order cost of 20*1200/500 plus 1.40 500/2 cost of carrying plus 91200 cost of packets, and an additional fixed cost of 300 giving 11,498. The other two figures were 11,177 and 11,104 for order quantities 750 and 1000.