## LOGISTICS MANAGEMENT

FRIDAY, MAY 9, 2003. TIME: 9.30 am - 12.30 pm

Please answer the question in Section A, and ONE question from each of Sections B, C and D.
(If more than the specified number of questions in Sections B, C and D are attempted, delete those questions you do not wish to have marked. Otherwise the examiner will mark the FIRST question in Sections B, C and D.)

Section A carries $\mathbf{4 0 \%}$ of the marks. All other questions carry equal marks.
Do NOT repeat questions in the answers, but show clearly the number of the question attempted on the appropriate page of the Answer Book.
(Note: Marks are awarded for the relevant use of contemporary Irish and international examples of marketing practice)

## SECTION A (40\%)

## 1. Case: Abbott Laboratories, Inc.

(a) Review the forecasting system used by Abbott.
(b) Evaluate Abbott's safety stock procedures.
(c) Adjudicate on the disagreement between the Hospital Products Division (HPD) and the Pharmaceutical Products Division (PPD) about how to modify the shipping schedule.
(d) Discuss the suggested computer allocation logic and the arguments for and against its use.

## SECTION B (20\%)

2. "In the new market place there is a strong case for arguing that individual companies no longer compete with other stand-alone companies, but rather that supply chain now competes against supply chain."
Martin Christopher
Explain the rationale for this viewpoint, giving illustrations where this is the case.
Discuss its consequences for companies in the future.
3. Describe the implications of serving customers on a global basis.
P.T.O.

## SECTION C (20\%)

4. (a) Demand from customers at a shop for bread rolls averages at 400 rolls per day. It costs the shop $€ 20$ to place an order and each roll costs 10 cent per day to store.
What is the economic order quantity?
(b) An opportunity has arisen whereby the shopkeeper could produce the bread rolls in the shop. Sales to other outlets are negligible. Hence the shopkeeper would like to confine his evaluations to possible benefits to the shop. The production rate would be 800 rolls per day and the set-up for a production run would be $€ 40$. The benefit would be that there would be an extra 20 cent profit made on each bread roll sold. What would be the economic order quantity in this new situation?
(c) Determine if it would benefit the shopkeeper to exploit the new opportunity.
(d) How would the evaluations be affected if the shopkeeper decided to limit his production run to the requirements of one day's sales?
5. A vegetable shop operates on a self-service basis. Customers arrive, collect their vegetables and go to the counter where the assistant weighs, prices and bags the purchases, and then accepts payment. Customers wait in a single queue, and are served on a first-come, first-served basis.
The inter-arrival time probability distribution is as follows:

| IAT (seconds) | $\mathbf{2 0}$ | $\mathbf{3 0}$ | $\mathbf{4 0}$ | $\mathbf{5 0}$ | $\mathbf{6 0}$ | $\mathbf{7 0}$ | $\mathbf{8 0}$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Probability | 0.07 | 0.14 | 0.26 | 0.22 | 0.16 | 0.10 | 0.05 |

Use the following random numbers to simulate the 11 inter-arrival times of 12 customers:

$$
\begin{array}{lllllllllll}
14 & 87 & 73 & 30 & 95 & 10 & 92 & 45 & 80 & 13 & 55
\end{array}
$$

The probability distribution of time to be served is:

| Service Time (seconds) | $\mathbf{2 0}$ | $\mathbf{3 0}$ | $\mathbf{4 0}$ | $\mathbf{5 0}$ | $\mathbf{6 0}$ | $\mathbf{7 0}$ | $\mathbf{8 0}$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Probability | 0.08 | 0.17 | 0.28 | 0.20 | 0.14 | 0.09 | 0.04 |

Use the following random numbers to simulate the service times of the 12 customers:
$\begin{array}{llllllllllll}04 & 23 & 01 & 68 & 85 & 30 & 80 & 26 & 55 & 59 & 91 & 11\end{array}$

Use your information to find the average waiting time and the average time spent in the vegetable shop.

## SECTION D (20\%)

6. An airfreight company plans to upgrade its fleet of planes. Two types are being considered: medium and small. The company has $€ 120$ million available for the purchase of the airplanes. The medium jets cost $€ 24$ million each and the small $€ 10$ million each. The company has sufficient pilots to operate eight (8) airplanes regardless of type. The only airplane maintenance company available has a maximum of 54 maintenance hours available per month. The small jets require on average six (6) maintenance hours per month. The medium jets require $50 \%$ more maintenance than the small ones. The medium and small jets each provide $€ 34,000$ and $€ 30,000$, respectively, contribution to profit and fixed costs.
(a) What is the best mix to buy between the two types of jet?
(b) Show how this would change and what would be the increase in profit due to each of the following:
(i) An extra $€ 10 \mathrm{~m}$ in the purchasing fund.
(ii) Hiring an extra pilot.
(iii) An extra three (3) hours maintenance per month.
7. Vegetables are grown, picked, stored, packaged, and sent for export through three ports: Larne, Dublin and Rosslare. From these ports vegetables are supplied to markets in Denmark, Germany, Holland and France. The following are the shipping costs per tonne and the supply and demand requirements.

Destination

| From | Denmark | Germany | Holland | France | Supply |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Larne | $€ 18$ | $€ 28$ | $€ 24$ | $€ 34$ | 200 |
| Dublin | $€ 24$ | $€ 20$ | $€ 12$ | $€ 18$ | 200 |
| Rosslare | $€ 20$ | $€ 16$ | $€ 30$ | $€ 14$ | 200 |

Because of a distributors’ agreement, shipments are prohibited from Dublin to Holland.
(a) Formulate this as a transport problem and find an initial solution.
(b) Use a transportation algorithm to find a new solution which, if used, would provide a less costly solution, if one exists. Explain and interpret your answer.
(c) If there is a better solution find it. Determine if your solution is optimal.

