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 **40%** 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.

SECTION A (40%)

1.   **Case: Benetton**

   (a)   Outline the characteristics of the U.S. knitwear market that differentiate it from the European market, and their impact on how Benetton should organise its logistics in the United States.

   (b)   Review the main issues concerning the development of the U.S. market.

   (c)   Suggest, with supporting reasons, an appropriate retailing strategy for Benetton to use in the United States.

   (d)   Propose and justify a plan that describes how Benetton's sales in the new U.S. market should be supported operationally.

   You may assume that the company has a target of 200 retail outlets to be opened per annum during its first five years in the United States of America.

P.T.O.

SECTION B (20%)

2. *"We are approaching the time when logistics and marketing need to be managed conjointly."*
    Martin Christopher
    Discuss how true is this statement. To the extent that you agree with it describe its implications for managing marketing logistics.

3. Describe how to develop a market-driven logistics strategy.

SECTION C (20%)

4. Kingstons Ltd., a men's tailoring and outfitters shop, has a 50 week working year. The demand for a particular style and size of a typical suit sold by Kingstons is subject to random variability. Demand for one such suit during one week of the working year is described by the following probability distribution:

Units demanded	Probability
4	0.1
5	0.3
6	0.3
7	0.2
8	0.1

Demand can only be satisfied (if at all) from stocks. The stock-holding costs are £18 per unit per annum. Each time that a re-order is made a cost of £12 is incurred irrespective of order size. There is a lead time of one week. The cost of being out of stock is estimated at 10% of the wholesale cost of one item which is £100.
Kingstons wish to minimize its annual inventory costs.

(a) Determine the optimum economic order quantity.

(b) Find the optimal re-order level and size of buffer stock.

5. An Irish shipping company has just docked an empty ship in a remote port prior to its heading for home. The captain will load some cargo to bring back. This will be his only trip to that port, so he wishes to load that combination of commodities which will yield the largest profit.
His ship has three holds (forward, centre, and aft) and their limits are:

Hold	Tonnes	Cubic Feet
Forward	2,000	100,000
Centre	3,200	140,000
Aft	1,900	95,000

The following list represents the possible commodities which can be taken on in any mix.

Commodity	Amount Available in tonnes	Cubic-foot volume per tonne	Profit per tonne
A	7,000	60	£20
B	6,500	50	£22
C	4,000	25	£18

In order to preserve the trim of the ship, the weight in each hold must be proportional to its weight capacity.

Set up the objective function and constraints which would solve this problem using linear programming. Do not solve it.

SECTION D (20%)

6. The Expert Solutions Company makes two products Integrated Solver and Expert Maker. Both products require time going through an assembly process and being tested. The relevant data are:

	Integrated Solver	Expert Maker
Assembly hours (per unit)	6	3
Testing hours (per unit)	9	9
Unit Cost (£)	112	100
Selling Price (£)	136	116
Maximum sales (units per week)	1,000	1,000

The number of assembly hours available per week is 6,000 and the number of testing hours available per week is 12,000. No other resources are in limited supply, but the costs of these resources have been allowed for in the unit cost figures.

P.T.O.

(a) Determine how much of each product should be produced in order to maximize profit.

(b) Find the shadow prices of the scarce resources at the optimum.

(c) A possible third product has a unit profit of £20 and would require 6 hours assembly and 10 hours testing. Should Expert Solutions make this product? Use the results in (b) to justify your answer.

7. Vegetables are grown, picked, stored, packaged, and sent for export through three ports: Dublin, Larne and Rosslare. From these ports vegetables are supplied to markets in France, Holland and Germany. The following are the shipping costs per tonne and the supply and demand requirements.

To Destination				
From	France	Holland	Germany	Supply
Dublin	£10	£16	£18	60
Larne	£20	£14	£18	30
Rosslare	£12	£22	£26	30
Demand	35	55	30	

(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.

(c) If there is a better solution find it and determine if it is optimal.

(d) Because of protests at Le Havre the route from Rosslare to France has been closed.
Re-solve the initial problem.

(e) You have been invited to do an interview on the radio during which you will be asked about the effect of the protest on Irish hauliers. Provide a simple yet exact explanation of the consequences in terms of changed routing instructions and consequent increases in costs.