



QUALIFICATION : B COM HONOURS

MODULE : QUANTITATIVE MANAGEMENT TECHNIQUES IN LOGISTICS

CODE : LMA8X06/LBE08X7

DATE : 19 NOVEMBER 2014 - EXAMINATION

DURATION : 180 MINUTES

TIME : 08:30

TOTAL MARKS : 180

EXAMINER(S) : Dr S Carstens

(EXTERNAL) MODERATOR(S) : Dr K Lambert

NUMBER OF PAGES : 7

INSTRUCTIONS TO CANDIDATES:

- Question papers must be handed in.
 - This is a closed book assessment.
 - Read the questions carefully and answer only what is asked.
 - Number your answers clearly.
 - Write neatly and legibly
 - Structure your answers by using appropriate headings and sub-headings.
 - The general University of Johannesburg policies, procedures and rules pertaining to written assessments apply to this assessment.
 - Answer each section on a different answer sheet.
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ANSWER ALL THE QUESTIONS

QUESTION 1

[66 MARKS]

GD Manufacturers produces a specific product at two plants from where it is distributed to four customers. Currently they transport the products directly from the plants to the customers. Management is concerned with this approach and has performed a network analysis which resulted in a proposal to introduce two warehouses in the system at pre-determined locations.

The monthly operating cost (fixed plus variable) associated with the first of the selected warehouses is R340 000. GD is not certain about the operating cost at the second warehouse, but the following estimated productivity information is available:

Throughput/month (tons)	Probability
150	0.1
200	0.15
250	0.35
300	0.3
350	0.1

In addition, the variable cost/ton (Rand/ton) may vary according to the following information:

Variable cost/ton	Probability
0.1	0.1
0.2	0.15
0.4	0.35
0.2	0.3
0.1	0.1

GD also estimates that a fixed monthly cost of R260 500 will be incurred in operating the second warehouse. Assist GD in estimating the monthly operating cost (fixed plus variable) of the second warehouse (use two different approaches).

The monthly demands at each of the customers have been established as follows:

Customer	Demand (tons)
C1	300
C2	250
C3	450
C4	250

Transport rates (Rand/ton) (from the plants to the customers) are as follows:

Plant	Customer			
	C1	C2	C3	C4
P1	14	15	20	17
P2	18	19	16	21

The plants have the following monthly capacities:

Plant	Capacity (tons)
P1	500
P2	1000

The transport rates (Rand/ton) from the plants to the proposed warehouses, as well as from the proposed warehouse to the customers, have been estimated as follows:

Plant	Warehouse	
	W1	W2
P1	2	13
P2	7	9

Warehouse	Customer			
	C1	C2	C3	C4
W1	3	4	5	12
W2	6	1	11	10

Based on transport cost only, do you agree with the proposal if the transport cost associated with the existing network (direct plant to customer distribution) equals R20 600/month?

QUESTION 2

[48 MARKS]

BB Company is a retailer that distributes various products. However, BB is particularly concerned with the cost associated with the gadget. The gadget is supplied at a cost of R75 and BB Company sells it for R125. However, the supplier normally charges a transport rate of R5/gadget, but has offered to supply the gadgets to BB at a cost of R3/gadget if a minimum of 100 gadgets is ordered at a time.

In order to maximize profits BB needs to minimize the total cost (inventory carrying, stockout and transport costs) associated with the gadget. The order quantity has a significant impact on these costs and BB decided to find the best order policy based on monthly demand.

Based on various factors BB calculated the following two order quantities:

Order quantity A

BB receives 80 gadgets monthly from the supplier at the beginning of each month. (First order is received in month 2).

Order quantity B

BB receives 160 gadgets every second month from the supplier at the beginning of the month. (First order is received in month 2).

The following information is available:

Inventory carrying cost R15 per gadget

Stockout cost
Starting stock

R30
100 gadgets

BB has recorded the following historical sales information for 20 months:

90 120 70 90 100 90 80 110 100 80
70 100 80 110 90 100 80 90 100 110

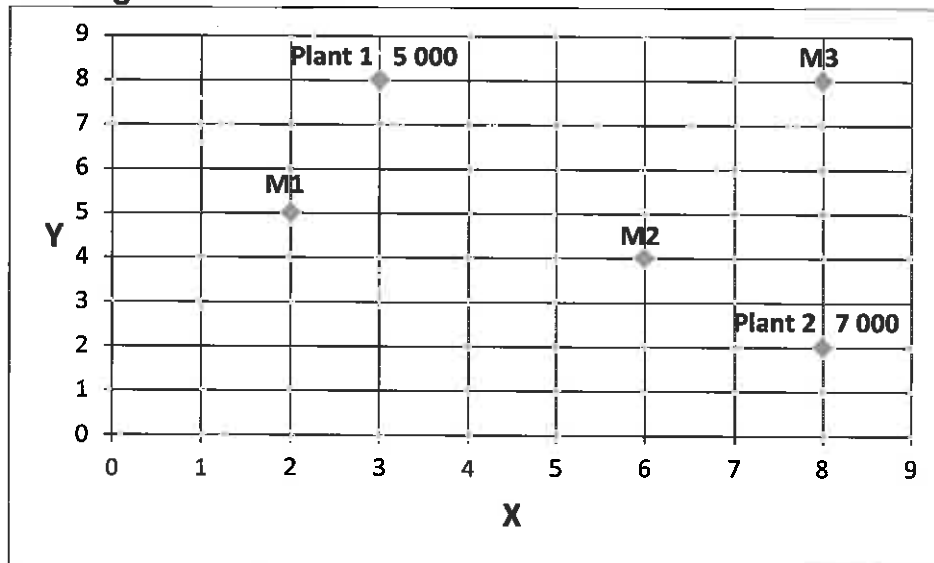
Which inventory policy should BB implement?

QUESTION 3

[66 MARKS]

ABC Manufacturing Company's current logistics network consists of two plants (P1 and P2) that serve three market points (M1, M2 and M3) through one warehouse. The figure below shows the geographic locations of each plant (and their annual capacities) and the market points.

ABC logistics network



Scale: 1 = 10 kilometre

The company has obtained the following annual sales figures for M1 and management believes that either a 3-year moving average or 3-year weighted moving average (weights = 0.6, 0.3 and 0.1 from the most recent year) approach will result in the most accurate forecast for the following year.

Year	Sales (units)
1	2296
2	984
3	1641
4	2953
5	2296
6	2953
7	3937
8	1312
9	3280
10	4264
11	2954
12	3282

The annual demand at M2 presents management with more difficulty, but they have obtained the following information:

Year	Sales (units)	Index
1	1844	87.95
2	790	37.77
3	1317	36.27
4	2371	48.3
5	1844	117.83
6	2371	72.3
7	3161	84.25
8	2054	96.25
9	2434	107.99
10	3424	120.22
11	2365	132.21
12	2300	143.93
13		141.1

After discussions between the logistics and financial managers it was concluded that the demand for the next year could be established by using trend regression, exponential smoothing ($\alpha = 0.7$) or causal regression analysis.

The estimate of the annual demand at M3 has not been finalized. However, a forecasting process was initiated and the forecast deviations (forecasts – actual value) are as follows:

Forecast technique		
4-month Moving Average	Exponential smoothing ($\alpha = 0.3$)	Linear Regression
100	-120	-97

-300	-290	280
200	-250	198
150	170	-160
-230	240	225
-200	-190	-190
170	180	170
160	179	-180
-245	-230	228
-157	160	-150

The associated forecasts are as follows:

Forecast technique	Forecast (annual tons)
4-month Moving Average	5358
Exponential smoothing ($\alpha = 0.3$)	4980
Linear Regression	5500

The transport rates (from the plants to the warehouse and from the warehouse to the markets) are as follows:

Facility	Rate (Rand/ton/km)
P1	0.04
P2	0.04
M1	0.095
M2	0.095
M3	0.095

1. Based on the information, what is the best location for a single warehouse?
2. Would you consider direct shipments from P1 to M1 (use a transport rate of 0.095 Rand/ton/km) and locating a warehouse in an optimal location in respect of the other facilities?

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Annexure

Question 1: Random Numbers

0.1893
0.5881
0.5894
0.9238
0.6199
0.5999
0.6862
0.9553
0.4994
0.6483

Question 2: Random Numbers

0.39
0.35
0.25
0.15
0.33
0.16
0.51
0.1
0.71
0.22

Question 3: Random Numbers

0.60663
0.131854
0.448004
0.931131
0.449886
0.710957
0.767041
0.863088
0.412092
0.314445