

UNIVERSITY OF SWAZILAND

FACULTY OF COMMERCE

DEPARTMENT OF BUSINESS ADMINISTRATION

MAIN EXAMINATION PAPER

DECEMBER, 2012

FULL TIME STUDENTS

TITLE OF PAPER : MANAGEMENT SCIENCE 1.

COURSE CODE : BA 302/BA406

TIME ALLOCATED : THREE(3) HOURS

TOTAL MARKS : 100 MARKS

INSTRUCTIONS

- (1) TOTAL NUMBER OF QUESTIONS IN THIS PAPER IS 6.**
- (2) THE PAPER CONSISTS OF SECTION A AND SECTION B.**
- (3) ANSWER THE QUESTIONS IN SECTION A WHICH ARE COMPULSORY AND ANY TWO (2) QUESTIONS IN SECTION B.**
- (4) THE MARKS ALLOCATED FOR A QUESTION/PART OF A QUESTION ARE INDICATED AT THE END OF EACH QUESTION/PART OF QUESTION.**
- (5) WHERE APPLICABLE, ALL WORKINGS/CALCULATIONS MUST BE CLEARLY SHOWN.**
- (6) NOTE: MAXIMUM MARKS WILL BE AWARDED FOR QUALITY, LAYOUT, ACCURACY, AND GOOD PRESENTATION OF WORK.**

THIS PAPER MUST NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

Section A. Answer both questions in this section. Total marks 50.

QUESTION1 (a).

$$\text{Max P:} = 200X_1 + 500X_2$$

St: $X_2 \leq 40$

$$1.2 X_1 + 4 X_2 \leq 240$$

$$0.5 X_1 + X_2 \leq 81$$

$$X_1; X_2 \geq 0$$

Solve the above Linear programming (maximization) problem graphically using the corner method and then mathematically. Part marks are more important than the final answer for problems of this nature. You are therefore urged to pay particular attention to clarity of your workings at each step of the problem giving explanations where necessary.

[25 Marks]

QUESTION 1(b).

You are the Procurement Manager at Shoprite Head Office. The Shoprite Matsapha management are hearing a case of one of its buyers who is being accused of corruption (getting palm greased) by suppliers who get orders for having awarded the supermarket group some discount. The disciplinary committee has consulted you as a specialist in the field of procurement and inventory management, to explain and demonstrate if it is sometimes possible to save costs when you buy on the basis of overall total cost instead of lowest price. Examine the following quantity discount schedule for children's toys at Shoprite Matsapha branch and develop your presentation from the information given.

Discount No.	Discount quantity.	Discount %.	Discounted cost per toy(E)
1.	0 to 999	0	5.00
2.	1000 to 1999	4	4.80
3.	2000 and above	5	4.75

You are further advised that the ordering cost is E49.00., per order, annual demand is 5000 toys, and the inventory carrying cost as a percentage of cost is 20%(0.2). You are not privy to the figures that the accused buyer presented to the disciplinary committee which will be glad to use your calculations as part of their reliable evidence. You are always guided by the principle of objectivity.

- a. Determine the EOQ for the different discount ranges that you have. (6)
- b. What EOQ figures are you going to use in this case where discounts are accepted? (3)
- c. Determine or calculate the relevant total minimum cost for the available alternatives (12)
- d. Advise the Committee on the quantity that you will have ordered if you were the buyer and explain why? (4)

[Total marks 25]

Section B. Choose 2 questions of your choice from this section. Each question carries equal marks (25)

QUESTION 2.

- a. The Director of Research and Development (R&D) department of a South African Chemical manufacturing company believes that the company's annual profits depend on the company's R&D budget. The new Chief Executive Officer does not agree with this view because it is not backed by facts and has asked for evidence. Here are the data for 6 months, and you are also told that the R&D budget for 2012 is R8 million.

Year	Millions spent on research and development	Annual profit (millions)
2006	2	20
2007	3	25
2008	5	34
2009	4	30
2010	11	40
2011	5	31

Uses the regression analysis to forecast annual profit from the amount budgeted for R & D and advise the CEO accordingly. (15)

- b. '*Keeping stock is being wasteful and a sign of inefficiency on the part of management*', That is what proponents of TQM who believe in JIT, Six-sigma and Lean management, think, but some managers still recommend keeping some stuff in stock. List five reasons usually given to justify keeping inventory and briefly explain each reason that you have given. (10)

[Total marks 25]

QUESTION 3

Managers are sometimes faced with decision situations that require them to engage specialists or consultants who can investigate an issue and produce a detailed report that will feed into management's decision making processes. This process costs a lot of money hence it is prudent to always estimate the amount of money that one has to pay for information.

Suppose an investor has options to launch a product with a market survey, or launch a product without a market survey or thirdly he has the option of not to launch the product. The probability of a good market is 0.6 and that of a bad market is 0.4. A market survey can improve accuracy of these probabilities and proper surveys are right 80% of the time and they predict negatively 70% of the time. Suppose the NPV of the yield will be E 5 million if the market is good and E3 million loss if the market is poor.

- (a) Draw a decision tree for the above (10)
- b) What are the EMVs at the various nodes you have in the diagram? (8)
- (c) What is your recommendation? (2)
- (d) How much should the investor pay for additional information (5)

[Total Marks 25]

QUESTION 4

a) Using information summarised in the table below you are further advised that previous experience, at a chemical manufacturing company shows a record of a standard deviation for quality control processes of 0.02 minute, with z value of 3. Calculate and illustrate the UCL, and LCL., and briefly explain what it means to say a system is in control (10 marks).

Sample

	1	2	3	4	5
1.	12.11	12.15	12.09	12.12	12.09
2.	12.10	12.12	12.09	12.10	12.14
3.	12.11	12.10	12.11	12.08	12.13
4.	12.08	12.12	12.15	12.10	12.12
mean(x)	12.10	12.12	12.11	12.10	12.12

b) A company has 3 new products A, B, and C of which it can introduce only one. The level of demand for each course of action might be low, medium or high. If the company decides to introduce product A, the net income that would result from the levels of demand possible are estimated at E20, E40 and E50 respectively. Similarly if B is chosen, net income is estimated at E80, E70 and minus E10, and for product C, E10, E100 and E40 respectively.

- a. Construct a pay-off matrix to present this information concisely. (3)
- b. Which product will be introduced if you use the maxi-max decision criteria?(3)
- c. Which product will be introduced if you use the maxi-min decision criteria?(3)
- d. Which product will be chosen if you use the mini-max regret decision criteria?(3)
- e. Which product will be introduced if you use the Expected value approach given that the state of nature probabilities are Low demand (0.1), medium demand (0.6), and high demand (0.3)? (3)

[Total 15 Marks]

QUESTION 5.

(a) Matsapha furniture manufacturers produce tables and chairs. The production process for each is similar in that both require a certain number of hours of carpentry work and a certain number of labour hours in the painting and varnishing department. Each table takes 4 hours of carpentry and 2 hours in the painting and varnishing shop. Each chair requires 3 hours in carpentry and 1 hour in the painting and varnishing shop. During the current production period, 240 hours of carpentry time are available and 100 hours in painting and varnishing time are available. Each table sold yields a profit of E7, each chair produced is sold for a E5 profit. Determine the best possible combination of tables and chairs to manufacture in order to reach the maximum profit. What profit do you expect to make? (10)

b). A Siteki Garage has developed a new device which should make the internal combustion engine more efficient. The chief mechanic is faced with three alternatives in regard to this device. The garage can proceed to manufacture and make the device itself; in this case the garage would make a profit of E2. for each device sold. As a second choice, the garage can sell the patent outright to another company for E1, million. In the third case, the garage can sell the patent for E.3 million and receive a royalty of E1. per device sold. Which is the optimal choice using the expectation principle if there is a .50 probability that the sales of the device will be .2million units, a .40 probability of sales of .8 million units, and if there is .10 probability of 1.4 million units being sold. Set up the decision matrix before applying the expectation principle. (15)

[Total Marks 25]

QUESTION 6.

A company has the opportunity of marketing a newly designed soccer ball. It has two possible courses of action: to test market on a limited scale or to give up the project completely. A test market would cost E 160,000 and current evidence suggests that consumer reaction is equally likely to be positive or negative. If the reaction to the test marketing were to be positive the company could either market the regalia in the SADC region or still give up project completely. Research suggests that a regional launch might result in the following sales:

Sales	Contribution (E. millions)	Probability
High	1.20	0.25
Average	0.3	0.50
Low	-0.24	0.25

If the test market were to yield negative results the company would give up the project. Giving up project at any one point would result in a contribution of E 60,000 from the sale of the Franchise to another company. All contributions have been discounted to present values.

- a) Draw a decision tree to represent the above situation, including all the relevant probabilities and financial values (10)
- b) Recommend a course of action for the company on the basis of the expected values (10)
- c) Explain what sensitivity analysis means using the above example. You do not necessarily need to do any calculations. (5)

[Total 25 Marks]

Good Luck!!