

UNIVERSITY OF SWAZILAND
FACULTY OF COMMERCE
DEPARTMENT OF BUSINESS ADMINISTRATION
SUPPLEMENTARY EXAMINATION PAPER; IDE STUDENTS
JULY 2013

TITLE OF PAPER : MANAGEMENT SCIENCE

COURSE CODE : BA 412

TIME ALLOCATED : THREE [3] HOURS

TOTAL MARKS : 100 MARKS

INSTRUCTIONS

- 1. TOTAL NUMBER OF QUESTIONS IN THIS PAPER IS 5**
- 2. THE PAPER CONSISTS OF SECTION A AND SECTION B**
- 3. ANSWER THE QUESTIONS IN SECTION A WHICH IS COMPULSORY AND ANY THREE [3] 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. 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 ALL QUESTIONS IN THIS SECTION:TOTAL MARKS FOR THIS SECTION IS 50.

QUESTION 1.

- a. A chemical firm produces sodium bisulphate in 100 kg bags. Demand for the product is 20 tonnes per day. The capacity for producing the product is 50 tonnes per day. Set up cost is E100.00 and storage and handling cost are \$5.00 per tonne per year. The firm operates 200 days per year. NB. 1 tonne is equivalent to 2000 kg.
- i. What is the annual demand for the chemical? **(2marks).**
 - ii. What is the economic production lot size? **(4 marks)**
 - iii. What is the maximum inventory the company can handle? **(4 marks)**
 - iv. Calculate the company's minimum total cost? **(5 marks)**
 - v. What is the approximate length of each production run? **(3 marks)**
 - vi. What is the cycle time? **(3 marks)**
 - vii. How much could the company save annually if the set up cost could be reduced to E25.00. **(4 marks)**
- [25 Marks]**

QUESTION 2.

- a. Suppose the director of planning at the Manzini town council' Sanitation division is interested in the relationship between the age of a garbage truck and the annual repair expense he should expect to incur. In order to determine this relationship, the director has accumulated information concerning four of the trucks the city currently owns. (see table below)

Truck Number.	Age of truck in years(x)	Repair expenses during last year(y) [(E)/year,(00)]
101	5	7
102	3	7
103	3	6
104	1	4

Calculate the regression line using information in the table and determine the estimated next budget if the city has to use a truck that is four (4) years old. **(13 Marks)**

- b. 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? **(12 marks)**

[Total Marks 25]

SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION. EACH QUESTION CARRIES 25 MARKS.

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.

- i. Draw a decision tree for the above **(8 marks)**
 - ii. Calculate the EMVs at the various nodes of the decision tree diagram and recommend the option the investor must adopt **(8 marks)**
 - iii. Determine how much the investor is supposed to pay for additional information and comment on challenges associated with determining this cost? **(5 marks)**
 - iv. What is sensitivity analysis? **(4 marks)**
- [Total Marks 25]**

QUESTION 4.

- a) A foreman is working with four (4) fitters and he has been asked to deal with five (5) jobs). The times for each job are estimated as follows;

		Fitters			
		Alfred	Bill	Charles	Dave
Job	1	6	12	20	12
	2	22	18	15	20
	3	12	16	18	15
	4	16	8	12	20
	5	18	14	10	17

Allocate the fitters to jobs in such a way that the total time taken is minimised. Clearly show minimum total time taken and the jobs are allocated all the fitters. (13 marks)

- b) Matsapha 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. (12 marks)

[Total Marks 25]

QUESTION 5.

There has been some oil discovery in the Lubombo region of Swaziland. The UNISWA BA 302 class won some lucrative amount in a lottery game and prefer to go for oil mining and continue with their studies under IDE. They however have to make a decision soon based on the following information.

The alternative actions that the class can adopt are; Don't drill (a1), Drill with no partners (a2), Drill in partnership with the University (a3), and Drill in partnership with family members (a4).

Drilling for oil has got its own natural risks and the following possible states of nature are likely to happen; the BA302 group will find no oil (s1), the BA302 group will find only 100,000 barrels of oil (s2) or, still the BA302 group will find only 500,000 barrels (s3).

The BA302 group consulted a Geologist and have been advised that from previous drilling experience, the Geologist feels that there are 90 chances in 100 that there is no oil, 8 chances

in 100 that there are 100,000 barrels of oil and 2 chances in 100 that there will be 500,000 barrels of oil.

If the group does not drill then the profit that will be derived will be zero, regardless of what lies beneath the surface. Thus, a hole is to be drilled, there will be some cost and there may be revenues. The cost of drilling a well is \$ 100,000.00, and if, and only if, oil is discovered, an extra \$40,000.00 must be spent on equipment such as pipes and pumps. Finally oil at the well head can be sold for \$7 a barrel. Under a2, the BA302 group would go it alone. Suppose there is no oil, the group will experience some \$100,000 loss in drilling cost, but they will not spend \$40 000 as there will be no need for pumps and pipes and of course there will be no revenue. If 100,000 barrels are found, the group will reap revenues in the sum of \$700,000. They will however need to pay the cost of drilling and to also pay for pumps and pipes. Finally, if they discover 500,000 barrels, there will be revenues from which the group will have to pay for both drilling and equipment. If the group decides to drill in partnership with the University (alternative three) the UNISWA has offered to participate 50-50 with the group in both losses and gains.

The group has another opportunity to drill in partnership with family relatives. The BA302 group will pay only for the well equipment and pumps if needed and would receive \$1 per barrel of oil recovered. The family members would take care of drilling costs and would receive \$6 for each barrel. The pay offs that are of interest are those for the BA302 group only because what their partners get or lose is of no importance to the BA302 group.

Find the expected profit for each act and then select the act with the greatest expected profit

[Total 25 Marks]

END OF EXAMINATION GOOD LUCK!!!!!!!!!!

TABLE 15.5

Table of Random Numbers																			
52	06	50	88	52	10	10	47	99	37	66	91	35	32	00	84	57	07		
37	63	28	02	74	35	24	03	29	60	74	85	90	73	59	55	17	60		
82	57	68	28	05	94	03	11	27	79	90	87	92	41	09	25	36	77		
69	02	36	49	71	99	32	10	75	21	95	90	94	38	97	71	72	49		
98	94	90	36	06	78	23	67	89	85	29	21	25	73	69	34	85	76		
96	52	62	87	49	56	59	23	78	71	72	90	57	01	98	57	31	95		
33	69	27	21	11	60	95	89	68	48	17	89	34	09	93	50	44	51		
50	33	50	95	13	44	34	62	64	39	55	29	30	64	49	44	30	16		
88	32	18	50	62	57	34	56	62	31	15	40	90	34	51	95	26	14		
90	30	36	24	69	82	51	74	30	35	36	85	01	55	92	64	09	85		
50	48	61	18	85	23	08	54	17	12	80	69	24	84	92	16	49	59		
27	88	21	62	69	64	48	31	12	73	02	68	00	16	16	46	13	85		
45	14	46	32	13	49	66	62	74	41	86	98	92	98	84	54	33	40		
81	02	01	78	82	74	97	37	45	31	94	99	42	49	27	64	89	42		
66	83	14	74	27	76	03	33	11	97	59	81	72	00	64	61	13	52		
74	05	81	82	93	09	96	33	52	78	13	06	28	30	94	23	37	39		
30	34	87	01	74	11	46	82	59	94	25	34	32	23	17	01	58	73		
59	55	72	33	62	13	74	68	22	44	42	09	32	46	71	79	45	89		
67	09	80	98	99	25	77	50	03	32	36	65	65	75	94	19	95	88		
60	77	46	63	71	69	44	22	03	85	14	48	69	13	30	50	33	24		
60	08	19	29	36	72	30	27	50	64	85	72	75	29	87	05	75	01		
80	45	86	99	02	34	87	08	86	84	49	76	24	08	01	86	29	11		
53	84	49	63	26	65	72	84	85	63	26	02	75	26	92	62	40	67		
69	84	12	94	51	36	17	02	15	29	16	52	56	43	26	22	08	62		
37	77	13	10	02	18	31	19	32	85	31	94	81	43	31	58	33	51		

Source: Excerpted from *A Million Random Digits with 100,000 Normal Deviates* (New York: Free Press, 1955), p. 7, with permission of the Rand Corporation.