

UNIVERSITY OF SWAZILAND

FACULTY OF COMMERCE

DEPARTMENT OF BUSINESS ADMINISTRATION

MAIN EXAMINATION PAPER

MAY, 2010

(FULL TIME / IDE STUDENTS).

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- TITLE OF PAPER : MANAGEMENT SCIENCE**
- COURSE CODE : BA 412**
- TIME ALLOWED : THREE (3) HOURS**
- TOTAL MARKS : 100 MARKS**
- INSTRUCTIONS :**
- (1) TOTAL NUMBER OF QUESTIONS IN THIS PAPER IS FIVE (5)
 - (2) THE PAPER CONSISTS OF SECTION A AND SECTION B.
 - (3) ANSWER THE QUESTION IN SECTION A WHICH IS 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.

NOTE: MAXIMUM MARKS WILL BE AWARDED FOR GOOD QUALITY LAYOUT, ACCURACY, AND PRESENTATION OF WORK.

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

SECTION A (COMPULSORY) - 50 MARKS

Q1. XYZ Ltd, a firm of the investment consultants, have been approached by one of their clients with regard to the investment of a sum of E100,000 over a period of two years. After a thorough survey of the available opportunities, two alternatives (*A* and *B*) are proposed, one involving a small amount of risk, the other being risk free. Investment *A* will lead to a return of either 8%, 10% or 12% in each year but, due to the nature of the investment, there will be some correlation between year 1 and year 2 returns. This is shown by the following table which gives the probability of various returns in year 2 given the returns in year 1.

<i>Year 1</i>	<i>Year 2</i>		
	8%	10%	12%
8%	0.6	0.3	0.1
10%	0.2	0.5	0.3
12%	0.1	0.2	0.7

At this stage, the three different returns in year 1 are considered to be equally likely. Investment *B* will produce a certain return of 9.5% per year. Ignore the effects of taxation, and you may assume that the interest earned in year 1 is re-invested for the second year.

Required:

- (a). Assuming that whichever alternative is chosen, the investment will be made for the full two- year period:
- (i). Draw a decision tree to represent the alternative courses of action and outcomes. (10marks).
 - (ii). On the basis of the expected value of returns, which investment would you recommend? (10marks).
 - (iii). What is the probability that investment *B* produces a greater return than investment *A*? (5marks).
- (b). Indicate how your decision tree should be modified if it is possible to switch from investment *A* to investment *B* at the end of year 1. In this case, what investment strategy will produce maximum expected return? (25marks).

SECTION B (ANSWER ANY TWO QUESTIONS) - 50 MARKS

Q2. UNISWA Maintenance Department employs five joiners. Each man has different abilities and skills and takes a different amount of time to do each job. At present, there are five jobs to be allocated. The times are given below:

	<i>Time per job (hours)</i>				
	<i>Job 1</i>	<i>Job 2</i>	<i>Job 3</i>	<i>Job 4</i>	<i>Job 5</i>
M1	25	16	15	14	13
M2	25	17	18	23	15
<i>Employee</i> M3	30	15	20	19	14
M4	27	20	22	25	12
M5	29	19	17	32	10

Required:

- (a). The jobs have to be assigned one job to one man. How should this be done in order to minimise the total man-time needed to finish all of the jobs? (12marks).
- (b). Assuming UNISWA Maintenance Department can employ an additional part time joiner who can do the same jobs in the following times:

	<i>Time per job (hours)</i>				
	<i>Job 1</i>	<i>Job 2</i>	<i>Job 3</i>	<i>Job 4</i>	<i>Job 5</i>
M6	28	16	19	16	15

How would this affect the assignment of the jobs to minimise total time? (13marks).

Q3. The manager of an inventory system believes that inventory models are important decision-making aids. Although the manager often uses an EOQ policy, he has never considered a backorder model because of his assumption that backorders are “bad” and should be avoided. However, with upper management’s continued pressure for cost reduction, you have been asked to analyze the economics of a backordering policy for some products that can possibly be backordered. For a specific product with annual Demand of 800 units, ordering cost is E150 per order and carrying cost is E10 per item per year and the cost of being out of stock is E20 per unit.

Required:

- (a). What is the economic difference in the EOQ and the planned shortage or backorder model? (7marks).

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- (b). If the manager adds constraints that no more than 35% of the units may be backorder and that no customer will have to wait more than 20 days for an order, should the backorder inventory policy be adopted? Assume 250 working days per year.
(Note: Details workings must be clearly shown). (18marks).

Q4. The following activities have been given as shown in the table below:

Activity	IPA	Normal		Possible reduction, weeks	Crash time, weeks	Extra cost for reduction of one week, (£)
		time weeks	cost, (£)			
A	-	2	400	1	1	400
B	A	1	0	0	1	0
C	B	4	200	2	2	125
D	B	6	450	4	2	175
E	D	3	700	2	1	250
F	C,E	3	200	2	1	200
G	F	4	600	3	1	125
H	D	2	0	0	2	0
I	D	3	250	1	2	200
J	H,I	8	600	4	4	100
K	G,J	2	450	1	1	250
L	K	2	200	1	1	150

Variable overheads are E300 per week for the project duration.

Required:

- (a). Determine the normal overall completion time and total cost of the project. (10marks).
(b). Calculate the minimum time in which the project can be completed and the associated minimum cost. (15marks).

Q5. Government Hospital, Mbabane operates a blood bank to meet the day to day demands of its patients. Blood is collected from donors by a team and a vehicle travelling to places such as factories, colleges and offices. The cost of collection is E100 per visit per day. The quantity collected per visit varies considerably as shown in table 2 below. On returning to the hospital, the blood, after testing and dating, is transferred into refrigerated storage until it is required. The holding cost for a week is E0.10 per pint.

If there is a sudden rush of demand or some major accident, then there is an emergency collection system which costs E150 irrespective of the quantity of blood required. This procedure is also initiated whenever the hospital runs out of blood. The present policy of the hospital is to plan a visit as soon as the stocks of blood at the hospital fall to 500

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pints. Visits take two weeks to set up. (*Note: Supply is available for use in the following week even though it has been delivered to allow for screening exercise*).

Table 1: Weekly demands for blood

<i>Number of Pints</i>	<i>Frequency</i>
50	30
150	80
250	50
350	10
450	30
Total	200

Table 2: Blood collected per visit

<i>Number of Pints</i>	<i>Frequency</i>
300	10
400	20
500	50
600	15
700	5
Total	100

Random Numbers Demands

34 58 21 12 71
89 63 27 17 43

Random Numbers Supplies

73 47 26 91 33
14 09 65 39 50

Required:

Using the random numbers as given and starting stock of 600 pints, simulate the system for 10 weeks and estimate the annual cost of the current policy. (25marks).