

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
COMMERCE, LOGISTICS AND SUPPLIES MANAGEMENT**

BCOM 162: BUSINESS MATHEMATICS II

STREAMS: BCOM

TIME: 2 HOURS

DAY/DATE: TUESDAY 07/08/2018

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS:

- Answer question ONE and any other TWO questions.
- Clearly show all your workings.

QUESTION ONE

(a) Explain the meaning of the following probability terms:

- | | | |
|-------|-----------------------|-----------|
| (i) | Random experiment | (2 marks) |
| (ii) | Independent events | (2 marks) |
| (iii) | Equally likely events | (2 marks) |

(b) Given the function $C(Q) = 120Q - Q^2 + 0.02Q^3$
Evaluate:

(i)	$\frac{d^2c}{dq^2}$	(3 marks)
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(ii)	$\int c(Q) dQ$	(3 marks)
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(c) The total profit (P) per acre on a wheat farm, has been found to be related to the expenditure per acre for (i) labour and (ii) Soil improvement. If X represents the shillings per acre spent on labour and Y represents the shillings per acre spent on soil improvement:

$$P = 48X + 60Y + 10XY - 10X^2 - 6Y^2$$

Determine the values of X and Y that maximizes profits. (15 marks)

- (d) From past experience, a machine is known to be set up correctly in 90% of occasions. If the machine is set up correctly, then 95% of good points are expected but if the machine is not set up correctly, then the probability of good parts is only 30%. On a particular day, the machine is set up and the first component produced is found to be good.

Required:

Determine the probability that the machine is set up correctly. (5 marks)

- (e) Explain the following terms as used in matrices:

(i) Equal matrix (2 marks)

(ii) Singular matrix (2 marks)

- (f) A restaurant sell beverages as follows:

2 cups of tea, 3 glasses of wine and a bottle of soda for Kshs 162, 3 cups of tea, 4 glasses of wine and 2 bottles of soda for Kshs 232, A cup of tea, 2 glasses of wine and a bottle of soda for Kshs 110

Required

Formulate the information in a simultaneous equation and hence form a matrix. (6 marks)

QUESTION TWO

- (a) Explain the meaning of decision theory and describe three decision making environments. (8 marks)

- (b) A food making factory is contemplating the introduction of a revolutionary new product with new packaging or replacing the existing product at a much lighter price (S_1) it may even make a moderate change in the composition of the existing product with a new packaging at a small increase in price (S_2) or may make a small change in the composition of the existing product, packaging it with the word New and a negligible increase in price (S_3). The three states of nature are

(i) High increase in sales (N_1)

(ii) No change in sales (N_2)

(iii) Decrease in sales (N_3)

With probabilities 0.8, 0.15 and 0.05 respectively. The marketing department for the company has worked out the payoffs (in Ksh '000') in terms of yearly net profits for each the strategies under the three events (expected sales)

States of nature

Strategies	N_1	N_2	N_3
S_1	700	300	150
S_2	500	450	0
S_3	300	300	300

Using the following decision making criterion, determine the strategies to be selected by this firm

- (i) Maximin (4 marks)
- (ii) Laplace (4 marks)
- (iii) Minimax regret (4 marks)

QUESTION THREE

(a) A manufacturer knows that if $x(00)$ products are demands in a particular week.

- (i) The total cost function (Ksh 000) is $14 + 3x$
- (ii) The total revenue function (Ksh 000) is $19x - 2x^2$

You are required to:

- (i) Determine the total profit function. (3 marks)
- (ii) Breakeven points what does it mean? (4 marks)
- (iii) Calculate the level of demand that maximizes profit and the amount of profit obtained. (5

marks)

(b) Pentice Industries must choose a supplier for the raw materials that is uses in its manufacturing divisions at C and B. Each division uses different units of steel, wood and plastic as shown in the table below

	Steel	Wood	Plastic
C	20	30	8
B	22	25	15

Two supply companies are being considered, W and C and can each supply all these materials but at different prices per unit as described in the following table.

	W	C
Steel	300	290

Wood	100	90
Plastic	145	180

Using matrix application, determine which suppliers should be chosen to supply:

- (i) C Division why? (4 marks)
- (ii) B Division why? (4 marks)

QUESTION FOUR

(a) A bag contains 5 red balls, 4 blue balls and 3 white balls. Two balls are drawn, one after the other without replacement. You are required to draw a tree diagram representing the experiment and determine:

- (i) The probability of getting a blue ball on first draw and white on second draw. (3 marks)
- (ii) Probability of getting white on both draws. (3 marks)
- (iii) Probability of getting white on both draws. (3 marks)
- (iv) Probability of getting a blue ball and a white ball. (4 marks)

(b) Tullow oil corporation is wondering whether to bid for an international oil drilling contract that is to be awarded in Turkana. If it bids, there is 65 per cent chance of winning the contract. If the contract is won, the company may opt to:

- (i) Set up a new drilling operations or
- (ii) More the already existing operation to a new site

The probability of success and failure together with the corresponding expected returns for the strategies are as follows:

Corresponding Outcome	Probability	New Drilling Operations Expected revenue (m)	Prob	Existing operations Expected revenue
Success	0.75	800	0.85	700
Failure	0.25	200	0.15	350

If the company does not bid or loses the contract, it can modernize its operations. This would result in either a low return of Kshs 30 million or moderate return of Ksh 48 million, with probabilities of 0.45 and 0.55 respectively.

Required:

- (i) Construct a decision tree for the problem showing clearly the courses of action. (6 marks)
 - (ii) By applying appropriate decision criterion recommend whether or not the company should bid the contract. (4 marks)
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