

UNIVERSITY OF KABIANGA

THIRD YEAR FIRST SEMESTER EXAMINATION FOR ACADEMIC YEAR 2017/2018

FOR BACHELOR OF ARTS IN ECONOMICS

COURSE CODE: ECO 314

COURSE TITLE: QUANTITATIVE METHODS

INSTRUCTION TO CANDIDATES

MAIN EXAM

Answer question one and any other three questions

Duration is 3 hours

QUESTION ONE

(a). Explain the meaning of the following terms as used in Quantitative Techniques

- (i) Mutually exclusive events
 - (ii) Conditional probability
 - (iii) Optimal strategy
- (3mks)

(b). Discuss the application of Quantitative Techniques in business management.

(10mks)

(c) What are the main assumptions of Games Theory

(4mks)

(d) The market research group of firm A has developed a sales forecasting function for its products and those of its competitors firm B. If firm A employs strategy A1 and firm B employs strategy B1 there will be a resulting gain of sh.5,000 in quarterly sales revenue for firm A. There are three strategies for firm A while firm B has four strategies. The increase or decrease in quarterly sales revenue for the different combination of strategies of firm A and B are represented in the pay-off matrix (Assume that this is a zero-sum game)

FIRM B

		STRATEGIES			
		B1	B2	B3	B4
FIRM A	A1	5,000	-2,000	12,000	-5,000
	A2	6,000	2,000	7,000	6,000
	A3	-2,000	0	-4,000	7,000

Using Maximin-Minimax principle, determine if it has a saddle point, if it does, determine the optimum strategy for firm A and firm B and find the value of the game.

(5mks)

QUESTION TWO

(a) Discuss the stages involved in quantitative decision making process. (5mks)

(b) Brookbond Company Limited has been faced with the decision alternatives of either to Expand, Build or Subcontract its operations. The table below represents the pay-offs for the company at various states of nature.

Decision maker alternatives

		EXPAND	BUILD	SUBCONTRACT
	HIGH	500,000	700,000	300,000
States of nature(demand)	MODERATE	250,000	300,000	150,000
	LOW	-250,000	-400,000	-10,000
	FAILURE	-450,000	-800,000	-100,000

The company has no information regarding the probabilities of the occurrence of the four states of nature. Advise the company on the best decision alternatives based on the following; (10mks)

- (i) Maximax criterion
- (ii) Maximin criterion
- (iii) Minimax regret criterion
- (iv) Laplace criterion
- (v) Hurwicz criterion ($\alpha = 0.7$)

QUESTION THREE

(a) Discuss the assumptions of input-output analysis in business (5mks)

(b) Suppose an economy has 3 sectors; Raw material, Service and Manufacturing. Where each unit of gross output of Raw material product Q_R requires 0.02 units of its own product, 0.05 units of Service product and 0.2 units of manufacturing sector product. Each unit of gross output of

Service product Q_S requires 0.03 units of its own, 0.04 unit of Raw material product, 0.01 unit of manufacturing sector product, while each unit of gross output of manufacturing product Q_M requires 0.1 units of its own, 0.04 unit of Raw material product and 0.01 units of Service sector product. Using Leontief inverse rule find the required gross output Q_R , Q_S and Q_M when the final demand for Raw material, Service and manufacturing sector products are given as 400, 200 and 600 respectively. (10mks)

QUESTION FOUR

- (a) Linear programming is widely used in various fields. State its limitation in spite of its wide usage (5mks)
- (b) The optimal simplex tableau for a maximization linear programming problem with all the \leq constraints are represented below;

Basic	Decision variables			Slack variables				Solutions
	X1	X2	X3	S1	S2	S3	S4	
S1	0	0	-3	1	0	-1	-3	50
S2	0	0	-1	0	1	-0.5	0	50
X1	1	0	2	0	0	0.5	0	100
X2	0	1	0	0	0	0	1	50
Z	0	0	6	0	0	4	5	1050

Required

- (i) The optimal solution (1mk)
- (ii) The status of each resource associated with each slack variable (3mks)
- (iii) The shadow prices of each of the resource (3mks)
- (iv) Suppose that it is desirable to increase the maximum availability of some of the resources, which ones do you recommend and why? (3mks)

QUESTION FIVE

A researcher studying neural control of human movement was curious about whether the length of a man's arm altered his reaction time on key pressing task. He took 20 male volunteers measured their right arm (they were all right handed) and then had them compete the key pressing task, the arm length and mean key pressing time are listed below

Arm length (cm)	50	100	65	78	72	59	98	81	76	65
Mean reaction time (m)	320	485	421	432	380	275	456	436	429	318

- (a) Determine if arm length can be used to predict the mean reaction time and predictive equation. (5mks)
- (b) Calculate the coefficient of determination and interpret the results (6mks)
- (c) Explain the assumption of the techniques used in (b) above (4mks)