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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION, 2024/2025ACADEMIC YEAR
FIRST YEAR, FIRST SEMESTER EXAMINATION
MASTER IN BUSINESS ADMIISTRATION

Date: 16th April, 2024
Time: 2.00pm –5.00pm

KMS 3106 - BUSINESS QUANTITATIVE ANALYSIS

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTION ONE (COMPULSORY)** AND **ANY OTHER THREE** QUESTIONS

QUESTION ONE (40 MARKS)

a) An insecticide manufacturing firm is in the process of developing a mosquito insecticide. The firm has come up with 3 generics of such insecticide X, Y and Z, which it has been testing in Kisumu County over the last few months. A random survey of the changing patterns between the three brands for the month of April and May carried out by interviewing 530 households revealed the following

	To	**April**	**X**	**Y**	**Z**	**May**
From	**X**	150	120	27	3	156
	Y	180	36	135	9	194
	Z	200	0	32	168	180

To keep track of the changing patterns, the firm has been interviewing the same households, none of which ceased to stay in Kisumu. Further the firm believes that all other Markov process conditions hold fairly well. Find the market share of each brand in the months of June and July separately (5 marks)

b) In The following data shows sales of some commodities in a certain retail shop for seven consecutive days

Commodity	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Rice	197.7	205.7	205.3	204.5	203.5	203.8	204.0
Wheat	158.8	159.1	158.9	158.2	160.0	160.5	160.8
Sugar	269.8	269.9	270.4	256.1	256.0	256.5	256.8

For each commodity, calculate:

i) Mean (4 Marks)
ii) Standard deviation (5 Marks)
iii) Coefficient of variation and state which commodity has stable sales (4 Marks)

c) The Rivatex Cotton Yarn Company claims that its product has an average breaking strength of at least 90 lbs. A Kisumu based weaving mill is interested in testing the company's claim regarding the breaking strength of the yarn. The weaving maser of the Kisumu based weaving mill considers it much more serious to buy a batch of yarn with a mean breaking strength of less than or equal to 90 lbs than to reject one with a mean breaking strength of more than 90 lbs. From the mill's past experience with this type of cotton yarn from previous suppliers, it was observed that the standard deviation of the breaking strength is 12 lbs.

In order to test Rivatex's claim, a sample of 16 pieces of yarn was found to be 92 lbs given this sample information should the weaving master accept the Rivatex's claim? Use 5% level of significance (6 Marks)

d) Quality suppliers Co.Ltd manufactures three products A, B and C. Each product requires certain amount of raw materials as well as labour. Product A require 2kg,3kg and 2kg of raw materials 1,2, and 3 respectively and 6manhours of labor. Product B requires 3kg ,2kg 8kg and 8manhour while product C requires 4kg, 2kg, 5kg and 4manhour respectively. The three raw materials cost Ksh20, Ksh80 and Ksh25 per kilogram respectively while labour costs Ksh80 per hour. The company receives an order for 800,2000 and 600 units of products A, B and C respectively.

Perform appropriate matrix operations to determine;

i) Total quantities of the four resources required to satisfy the order (5 Marks)
ii) The combined total cost of production. (4 Marks)

e) A heart diseases charity organization in planning a fund-raising campaign. From similar undertakings in the past, it has been established that total contributions are a function of the length of time that a campaign is conducted. The response function has been estimated, which indicates the percentage of a city's population who will make a donation of the number of days **t** of the campaign. The function is of the form

$$P = 0.5\left(1 - e^{-0.05t}\right)$$

A city has a population of 1.8 million people and each person who responds to the campaign donates on average KSh. 4000. Determine the expected total donations if the campaign is conducted for 10 days (3 Marks)

f) Muteti, a mayoral candidate in the just concluded local authorities' elections, is re-evaluating his campaign strategy. He discovers that he used an advertisement budget of KSh. 15 million. He used four advertising options, newspaper, radio, television and billboard. The costs for the media options averaged KSh. 1500, KSh. 2500, KSh. 10000 and KSh. 7500 respectively. Suppose Xi denote the number of units purchased of media option **i,**

i) Write an equation for the total advertisement budget. (2 Marks)
ii) Muteti purchased 100 newspapers ads, 300 radio ads and 50 billboard ads. Determine how much was allocated the purchase of TV ads. (2 Marks)

QUESTION TWO (20 MARKS)

a) Highlight the distinction between the concepts of break-even point and the classical micro-economic principle of profit maximization, using business decision-making examples (5 Marks)

b) TQM Products Ltd sells its principal product in the COMESA region. Sales surveys have indicated that annual demand for the product will depend on the price charged. The demand function for the product has been estimated as

$$q = 100{,}000 - 200\,p$$

where **q** is the number of units demanded each year and **p** is the price in K£ per unit
A research consultant has established the total cost of producing q units to be of the form

$$C = 150{,}000 + 100q + 0.003q^2$$

Determine the maximum profit (8 Marks)

c) Exciter wines Ltd. produces and bottle three types of wine viz. exciter soother and comforter. to produce 100 bottle of exciter requires contribution worth 20 bottles from exciter section, 10 bottle from soother section and 15 bottle from comforter section. the corresponding inputs to produce 200 bottle of soother wine are worth 10,20 and 10 bottle; and to produce 5000 bottle of comforter wine are worth 50,40 and 80 bottles respectively.
Exciter wines Ltd has projected that during the Christmas festivities 500,400 and 800 thousand bottle of the three wines respectively will be consumed.

Determine the number of bottle of each wine that should be produced to satisfy the forecasted demand (7 Marks)

QUESTION THREE (20 MARKS)

a) Explain a business system that can be modelled as a system of linear equation consisting of three unknowns. Develop a possible system of equation and solve using inverse method (5 Marks)

b) Kenya Farmers Association (KFA) imports and sells two types of tractors; Muddy Power (MP) and Soil Power (SP). Each make is stored in a separate ground. For every 100 MP tractors imported, 15 are used for security fence at MP's ground and 10 for the same purpose at SP's ground. Eight of every 100 SP's imported are used for security fences at MP's ground and 11 at SP's ground. Each MP fence tractor assigned to MP's ground requires 12 plugs and 5 contact points each month for routine maintenance. An MP fence tractor assigned to SP's ground requires 10 plugs and 4 contact points per month. A SP's fence tractor requires 10 plugs and 4 contact points at MP's ground and 8 plugs and 4 contact points at SP's ground. Plugs cost KSh. 300 each and contact points KSh. 800 each.

During the month of June 2023, KFA inventory entries indicated that they imported 200 and 150 non-fence MP and SP tractors respectively.

Using appropriate matrix operations, determine

i) The total number of tractors of each type imported in the month of June 2023 and their categories (8 Marks)

ii) The total cost of maintenance spares for the tractors imported in June 2023 (7 Marks)

QUESTION FOUR (20 MARKS)

a) National Oils (NO) Ltd and Local Oils (LO) Ltd are competitors in cooking oils. They both pack cooking oil in 2kg cans but NO's cans have a standard deviation of 0.04kg and LO's 0.05kg. A can is considered reject if its weight falls below 1.93kg otherwise it is normal. NO sells its reject cans for KSh. 400 and normal cans for KSh. 490 while the respective prices for LO are KSh. 380 and KSh. 500.
Kim orders 1,000 cooking oil cans from NO and Joe the same number from LO. Calculate the total amount that each will pay. (8 Marks)

b) In an engineering unit, the following set of data was collected from the production records of a machine

Speed of Machines (X)	Number of Defective pieces (Y)
14.2	9
11.9	6
15.9	12
18.4	12
9.1	6
14.9	9
16.4	11
10.2	7
14.1	10
16.7	9
11.6	8
12.0	7

Using the above data:

i) Estimate the regression equation and interpret the values of the regression constants (7 Marks)

ii) To what extent does speed of machines influence the number of defective pieces? (5 Marks)

QUESTION FIVE (20 MARKS)

a) Ng'erech, a business analyst is not quite sure when to use the mean, median and mode as a measure of central tendency. Explain the suitability of each of the measures. (6 Marks)

b) Hon. Ababu Namwamba, the Cabinet Secretary for Gender and Sports, ordered a study in 2023 to establish the age distribution of all players in the national teams. This was motivated by the allegations that there were wrong age alignments in the teams. At the end of the study, the following data was compiled

Age (Years)	20-24	25-29	30-34	35-39	40-44	45-49	50-54
No. of Players	11	24	30	18	11	5	1

i. Determine the cut-off ages if 30%, 50% and 20% of the players must belong to Harambee, Malkia and Simba teams respectively (7 Marks)

ii. The CS, who has some statistical knowledge, suggests that normal distribution should be used to analyze the data more rigorously. Should the ministry conform. (7 Marks)