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ALOPE UNIVERSITY COLLEGE

...Bastion of Knowledge....

OFFICE OF THE DEPUTY PRINCIPAL

ACADEMICS, RESEARCH AND STUDENTS' AFFAIRS

UNIVERSITY EXAMINATIONS

2019 /2020 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER REGULAR EXAMINATION

FOR THE BACHELOR IN BUSINESS MANAGEMENT

COURSE CODE: BBM 113
COURSE TITLE: BUSINESS MATHEMATICS I

DATE: 05/12/2019   **TIME: 9.00-12.00pm**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

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QUESTION ONE – Compulsory

(a)Explain the role of mathematics in business management.   **[4 Marks]**

(b) Briefly explain three importance of set theory in business.   **[3 marks]**

(c)A supermarket owner sells four of his products:Toys, furniture, Radios and clothing in each of the two towns, Kisumu and Eldoret in three categories: consumers, wholesalers and retailers as given below:

Kisumu

	Product			
	Toys	**Furniture**	**Radios**	**Clothing**
Consumers	4	6	7	4
Retailers	3	2	1	6
Wholesalers	4	3	5	3

Eldoret

	Product			
	Toys	**Furniture**	**Radios**	**Clothing**
Consumers	4	5	3	6
Retailers	7	8	4	4
Wholesalers	2	4	0	1

In order to sell her products in these towns, the supermarket owner pays a commission to sales-representatives, town managers and division managers as shown below:

	Sales-representatives	**Town Manager**	**Division Manager**
Kisumu	6%	5%	2%
Eldoret	4%	3%	3%

The selling price per unit is given as follows:

	Selling price per unit in Shs.
Item	
Toy	200
Furniture	1000
Radio	500

Clothing	700

Required:
Using matrix algebra

i) Find the total sales in units by product and customer type. **[1Mark]**

ii) Determine the difference between the two towns in sales (in units) by product and customer type. **[2 Marks]**

iii) Calculate the total sales in shillings by each town. **[2 Marks]**

iv) Find sales in shillings by customer type for each town. **[2 Marks]**

v) Compute the amount of commission to be paid by type of commission and type of customer. **[2 Marks]**

(d) Solve the following systems of linear simultaneous equations by matrix algebra:

$$4x + 2y + 3z = 4$$
$$5x + 6y + 1z = 2$$
$$2x + 3y = -1$$

[6 marks]

(e) For the universal set $T = \{1, 2, 3, 4, 5\}$ and its subset $A = \{2, 3\}$ and $B = \{5\}$

Find
    i) A^1 **[1 mark]**

    ii) $(A^1)^1$ **[1 mark]**

    iii) $(B^1)^1$ **[1 mark]**

QUESTION TWO
A marketing division toothpaste manufacturing company has worked out the following transition probability matrices concerning the behaviors of customers before and after an advertising campaign.

Transition probability matrix
(Before advertising campaign)

| | TO | |
FROM	Our Brand (State I)	Another Brand (Sate II)
Our brand (State I)	0.8	0.2
Another Brand (sate II)	0.4	0.6

Transition probability matrix
(After advertisement)

| | TO | |
FROM	Our Brand (State I)	Another Brand (Sate II)
Our brand (State I)	0.9	0.1
Another Brand (sate II)	0.5	0.5

Required:
If the advertising campaign costs Shs 20,000 per year, would it be worthwhile for the company to undertake the campaign?
(NOTE: You may suppose there are 60,000 buyers of toothpaste in the market and for each customer average annual profit of the company is Shs2.50.)   **[15 marks]**

QUESTION THREE
a) Explain the following terms as used in set theory:

i)   Union of sets   **[1 Mark]**
ii) Intersection of sets   **[1 Mark]**
iii) Complement of a set   **[1 Mark]**

b) *The Standard Group* deals with the distribution of three types of newspapers namely*The Standard*, *The Business Daily* and *The Nairobian*. The company recently conducted a market survey to determine the newspaper preferences of 100 households in a certain town. The following results were obtained from the survey.

- 48 households read *The Standard* newspaper.
- 18 households read *The Business Daily* newspaper.
- 29 households read *The Nairobian*.
- 8 households read *The Standard* and *The Nairobian*newspapers.
- 8 households read *The Standard* and *The Business Daily*newspapers.
- 3 households read *The Nairobian*and*The Business Daily*newspapers.
- 3 households read the three newspapers.

Required:

i)   Represent the above information using a Venn diagram.   **[3 Marks]**

ii) The number of households that read *The Standard*newspaper but did not read *The Business Daily* newspaper. **[3 Marks]**

iii) The number of households that read*The Nairobian* and *The Business Daily*but did not read *The Standard*newspaper. **[3 Marks]**

iv) The number of households that read none of the newspapers. **[3 Marks]**

QUESTION FOUR

a) Define the following terms as used in Markov analysis:

(i) Equilibrium or steady state **[1 mark]**

(ii) Absorbing state **[1 mark]**

(iii) Closed state **[1 mark]**

b) Give three areas where Markov process or chains are applied. **[3 Marks]**

c) The past records of Menengai Industries Limited indicate that 4 out of 10 of the company's orders are for export. Further, thisindicates that 48 per cent of all orders are for export in one particular quarter. They expect to satisfy about 80 orders in the next financial quarter.

Required:

i) Determine the probability that they will break their previous export record.**[6 Marks]**

ii) Explain why you used the approach in (i) above. **[3 Marks]**

QUESTION FIVE

a) Outline**four** basic assumptions of linear programming. **[4 Marks]**

b) A rubber company is engaged in producing three different types of tyres T_1, T_2 and T_3. These tyres are produced at the company's two plants, which have different production capacityin a normal 8-hour day;Plant A can produce 50,100 and 100 tyres of Types T_1, T_2 and T_3, respectively while Plant B can produce 60 tyres of Type T_1, 60 of Type T_2 and 200 of Type T_3. The monthly demand for tyres of Type T_1, T_2 and T_3 is 2500, 3000 and 7000 units, respectively. The daily cost of operation of Plant A is Kshs. 2500 and that of Plant B is Kshs. 3500.

i) Formulate a Linear programming model to minimize the monthly requirement. **[5 Marks]**

ii) Plot a graph of the above model show the feasible region. **[4 Marks]**

iii) Determine the minimum cost of operation. **[2 Marks]**

QUESTION SIX

a)Differentiate between a function and an equation. **[2 Marks]**

b)A company invests in a particular project and it has been estimated that after x months of running, the cumulative profit (Shs'000') from the project is given by the function $31.5x-3x^2-60$, where x represents time in months. The project can run for nine months at the most.

i) Draw a graph which represents the profit function for the nine months. [5 Marks]

ii) Calculate the 'break even' time points for the project. [3 Marks]

iii) Determine the initial cost of the project. [3 Marks]

iv) Use the graph to estimate the best time to end the project. [2 Marks]

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