Strathmore
UNIVERSITY

STRATHMORE INSTITUTE

Diploma in Business Management (DBM)
Diploma in Business Creation and Entrepreneurship (DE)
Diploma in Journalism and New Media (DJNM)
Diploma in International Relations (DIR)
Diploma in Procurement (DPR)

END OF SEMESTER EXAMINATION

DBM 1204: BUSINESS MATHEMATICS

Date: 16th April, 2020 **Time: 2 Hours**

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
3. Do not write on the question paper.

QUESTION ONE (30 MARKS)

(a) A portfolio management expert is considering 30 stocks for investment. Only 15 stocks will be selected for inclusion in a portfolio. How many different combinations of stocks can be considered? [3 Marks]

(b) Consider the following example regarding the number of male and female workers in two shops I and II.

	Male Workers	Female Workers
1	10	18
2	25	28

Represent the above information in the form of a 2×2 matrix. What do the entry in the 2nd row and 2nd column represent? [2 Marks]

(c) Let a universal set U be defined as $U = \{a, b, c, d, e, f, g\}$ and further $A = \{a, b, d, g\}$, $B = \{d, a, b, c\}$ and $C = \{e, g\}$. Determine:

(i) $|B|$, the cardinality of B [1 Marks]

(ii) A^c, the complement of A [2 Marks]

(iii) $B \cap C$ [2 Marks]

(d) Suppose that Ksh. 25,000 is invested at an annual rate of 6.5% compounded annually, determine the amount paid after 10 years. [3 Marks]

(e) A manufacturing company produces and sells tables. The cost function is given by:

$$C(x) = 4x + 120\sqrt{x} + 4000$$

where x is the number of tables. The tables are sold for $ 200 each.

Find

(i) The total cost of producing 25 tables. [2 Marks]

(ii) The total profit from producing and selling the 25 tables. [3 Marks]

(f) Suppose that in a town, 1000 people are selected by random types of sampling for a study on their means of transportation to work. Results were as follows: 250 go to work by car only, 280 go to work by bicycle only and 140 use both means of transport. How many people:

(i) Use at least one of the two transportation types? [2 Marks]

(ii) Go by neither car nor bicycle? [2 Marks]

(g) Given the matrices

$$\mathbf{A} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad \text{and} \quad \mathbf{B} = \begin{pmatrix} 1 & 3 \\ 5 & 6 \end{pmatrix}$$

Determine,

(i) $\mathbf{AB}$ [2 Marks]

(ii) $\mathbf{A^{-1}}$ [2 Marks]

(h) At *Grand Cinema*, it costs $47 to purchase 4 adult and 2 child tickets. It also costs $25.50 to purchase 1 adult and 3 child tickets. Using appropriate technique, determine the costs of an adult and a child ticket at the *Grand Cinema*. [4 Marks]

QUESTION TWO (15 MARKS)

(a) An advertising agency finds that, of its 200 clients, 145 use Television, 140 use Radio and 160 use Magazines. Also, 115 use Television and Magazines, 105 use Television and Radio, 125 use Radio and Magazines, 100 use all the three. Draw **Venn diagram** to represent these data. Find

(i) how many use Radio only? [2 Marks]

(ii) how many use Television only? [2 Marks]

(iii) how many use Television and Magazine but not radio? [3 Marks]

(b) (i) Distinguish the terms sequence and series [2 Marks]

(ii) A sequence is given by the formula $u_n = 3n + 5$ for $n = 1, 2, 3, \cdots$
Write down the first five terms of this sequence. [2 Marks]

(c) Solve the following pairs of equations simultaneously [4 Marks]

$$2x + y = 12$$
$$-5x + y = -2$$

QUESTION THREE (15 MARKS)

(a) **ABC company** manufactures its products at a cost of \$4 per unit and sells them for \$10 per unit. If the firm's fixed cost is \$12,000 per month:

(i) What is the cost function? [2 Marks]

(ii) What is the revenue function? [1 Marks]

(iii) Determine the firm's break-even point. [2 Marks]

(iv) What is the loss sustained by the firm if only 1,500 units are produced and sold per month? [3 Marks]

(b) Find the cardinality of the following sets.

i) The set of months in a year [1 Marks]

ii) $C = \{x : x \in \mathbb{N}, x \leq 100\}$ [1 Marks]

iii) The set of letters in the word **MALAYALAM** [1 Marks]

(c) A shop in Nairobi sells stationaries as follows: 3 rulers and 2 pencils cost Kshs. 92 while 1 ruler and 3 pencils costs Kshs. 68. Determine the costs of a pencil and a ruler in the shop. [4 Marks]

QUESTION FOUR (15 MARKS)

(a) The resale value, R of a piece of industrial equipment has been found to behave according to the function $R(t) = 750,000e^{-0.08t}$ where t is the time in years from the date of purchase and R is the resale value in Kshs. Required:

(i) What is the original value of the piece of equipment? [2 Marks]

(ii) What is the expected resale value after **five** years? [2 Marks]

(b) A finite set $S = \left\{8, \sqrt{2}, \frac{2}{3}, -2.7, 33, \pi, -6\right\}$. Using the set notation $\{....\}$, write the sets of

(i) natural numbers in G [2 Marks]

(ii) integers in G [2 Marks]

(iii) irrational numbers in G [2 Marks]

(c) Joypasers Bus company sold 1000 tickets in the year 2018. Adult tickets cost \$8.50 while children's cost \$4.50, and a total of \$7300 was collected. How many tickets of each kind were sold by the company? [5 Marks]

QUESTION FIVE (15 MARKS)

(a) Determine the amount of simple interest on \$800 invested for a period of 1 year at a rate of 6% per annum. [3 Marks]

(b) A marketing survey of 1200 commuters found that 800 listen to the news, 700 listen to music, and 450 listen to both. Let N be the set of commuters in the sample who listen to news and M be the set of commuters in the sample who listen to music.
Fill out a two-set Venn diagram [3 Marks]

Give the number in each of the sets below.

(i) $N \cup M$. [2 Marks]

(ii) $N^c \cap M$. [2 Marks]

(iii) $N^c \cap M^c$. [2 Marks]

(c) Given a committee of 10 persons. In how many ways can we select a chairperson, vice chairperson and recording secretary? [3 Marks]

END OF PAPER