Strathmore
UNIVERSITY

STRATHMORE INSTITUTE

DIPLOMA IN BUSINESS MANAGEMENT/ DIPLOMA IN ENTREPRENEURSHIP/

DIPLOMA IN INTERNATIONAL RELATIONS

END OF SEMESTER EXAMINATION

DBM 1204; DE/ DIR1106; BUSINESS MATHEMATICS

DATE: 26th April, 2022 **Time: 2 Hours**

Answer Question ONE and any other TWO questions in this Paper.

Question One (30 marks)

(a) Differentiate between each of the following terms:
   (i) Permutation and Combination. (2 marks)
   (ii) A set and a relation (2 marks)

(b) An analyst rounds off $0.\dot{5}$ to 0.5. Calculate the error in this rounding off. (3 marks)

(c) A company with four retail stores has 35 TVs t, 60 stereos s, 55 videocassette recorders v and 45 camcorders c, in store 1; 80t, 65s, 50v, and 38c in store 2; 29t, 36s, 24v, and 32c in store 3; and 62t, 49s, 54v, and 33c in store 4.
   (i) Express the present inventory in matrix form. (2 marks)
   (ii) The parent company sends out deliveries, $D = \begin{pmatrix} 8 & 6 & 9 & 5 \\ 4 & 7 & 5 & 2 \\ 6 & 3 & 0 & 8 \\ 5 & 9 & 7 & 4 \end{pmatrix}$ to its stores. What is the new level of inventory? (2 marks)

(d) A computer company must hire 25 programmers to handle systems programming jobs and 40 programmers to handle applications programming. Of those hired, 10 will be expected to perform jobs on both types. How many programmers must be hired? (3 marks)

(e) A company has a fixed cost of €8250 and a marginal cost of €450 for each item produced. If the company receives €800 for each item sold, how many items must it sell to make a profit of € 57 500 000? (4 marks)

(f) A retiree receives $ 5120 a year interest from $ 40, 000 placed in two bonds, one paying 14% and the other paying 12%. How much is invested in each bond? (4 marks)

(g) A firm wants to select a group of 8 out of its 20 employees to attend a business trip. In how many ways can this be done if there is a couple who must not be separated? (3 marks)

(h) What amount will an account have after 1.5 years if $ 8000 is invested at an annual rate of 9%:

(i) Compounded weekly (3 marks)

(ii) Compounded continuously (2 marks)

Question Two (15 marks)

(a) Of 32 people who save paper or bottles or both for recycling, 30 save paper and 14 save bottles. Find the number of those who:

(i) save both. (2 marks)

(ii) save only paper. (2 marks)

(iii)save only bottles. (2 marks)

(b) One hundred students were enrolled for courses in any of the three areas: Law, Accounting and Business Management.

45 had taken Law
38 had taken Accounting
21 had taken Business Management
18 had taken Law and Accounting
9 had taken Law and Business Management
4 had taken Accounting and Business Management
23 had no courses in any of the three areas.

If a student taking exactly one course in any of the three areas pays fee of ksh. 300 000, a student taking exactly two course in any of the three areas pays ksh. 450 000, any student taking all the three pays ksh. 600 000 and those not taking courses in the three areas pays ksh. 250 000 each per year. Represent the information on a Venn diagram hence calculate the total amount paid by the students in one year. (6 marks)

(c) How many milligrams of carbon – 14 would have to be present at the beginning in order to have 25 milligrams present after 18,000 years? Give your answer to the nearest milligram if $A = A_0 e^{-0.000124t}$. (3 marks)

Question Three (15 marks)

(a) Show that $\sqrt{5}$ is not rational. (4 marks)

(b) Find the domain of $g(t) = \frac{\sqrt{10t-5}}{t^2-16}$ (4 marks)

(c) A company that sells computers established the following revenue and cost functions
$R(x) = 3x(2200 - 3x)$
$C(x) = 19600 + 660x$

Where x is thousands of computers, and $R(x)$ and $C(x)$ are in thousands of dollars.

(i) Write an expression for the profit in terms of x (2 marks)

(ii) Find the output that produces the maximum profit (3 marks)

(iii) Find the maximum profit (2 marks)

Question Four (15 marks)

(a) A company produces three products, each of which must pass through three different departments. The table below shows the hour requirement of each product. The weekly capacity of each department is also given in terms of working hours.

Department	**Product**			**Hours available per week**
	I	**II**	**III**	
A	2	3.5	3	1200
B	3	2.5	2	1150
C	4	3	2	1400

(i) Form a system of linear equations to represent this information. (2 marks)

(ii) Solve the system in (i) above using any matrix method. (5 marks)

(b) The revenue and cost functions of a company are given as $R(x) = -5x^2 + 750x$ and $C(x) = 100x + 20{,}000$ respectively.

(i) Determine the maximum revenue for the company (3 marks)

(ii) By plotting the graph of $R(x)$ and $C(x)$ on the same axes, determine the break-even levels. (5 marks)

Question Five (15 marks)

(a) A firm projects its profit to Ksh. 350 000 for the first month, Ksh. 700 000 for the second month, Ksh. 1 050 000 for the third month and so on. What will be the total projected profit at the end of $1\frac{1}{4}$ years? (3 marks)

(b) (i) A company wants to choose five men and six women to sit in the board. In how many ways can this be done if the choice is made from seven men and nine women? (2 marks)

(ii) A company has 7 senior and 5 junior officers. An ad hoc legislative committee is to be formed. In how many ways can a four-officer committee be formed so that it is composed of at least two senior officers? (3 marks)

(c) A man borrows \$5 400 from a bank and agrees to repay it by paying \$ 300 per month to reduce the loan and 1.5% of the unpaid balance each month for the use of the money. What is the total cost of the loan over 18 months? (3 marks)

(d) Due to reduced taxes, a person has an extra \$1,200 in spendable income. If we assume that the person spends 65% of this on consumer goods, and the producers of these goods in turn spend 65% on consumer goods, and that this process continues indefinitely. What is the total amount spent on consumer goods to the nearest dollar? (4 marks)