



Scott Christian
UNIVERSITY
A Dynamic Centre of Academic Excellence

SCHOOL OF PROFESSIONAL STUDIES

BACHELOR OF INFORMATION COMMUNICATION TECHNOLOGY

UNIT CODE/NAME: BCT 112 FOUNDATIONS OF MATHEMATICS

January-April 2020/2021 Supplementary/Special Exam -Time: 2 Hours

Instructions: Answer Question ONE (Compulsory) and any other TWO questions.

QUESTION ONE

- a) Let $U = \{x : x \in \square, x \leq 10\}$ be the universal set, $A = \{1, 2, 3, 9\}$, $B = \{1, 3, 5, 6, 7, 8\}$ and

$$C = \{1, 3, 9\}$$

- i) Illustrate this information in a Venn diagram. (3 Marks)

- ii) Find $A \cup (B \cap C)$.

(2 Marks)

- iii) Find $A \oplus B$, the symmetric difference of A and B .

(2 Marks)

- b) Solve the quadratic equation:

$$-9.6 + 2x - 0.1x^2 = 0 \text{ (4 Marks)}$$

- c) Find the amount that will result if \$3500 is invested for 6 years at 8% compounded quarterly.

(4 Marks)

- d) The Profit in dollars from the production and sale of x units of a product is modeled by

$$P(x) = -x^2 + 60x - 50. \text{ Find the profit if:}$$

- i. 20 units are produced.

(2 Marks)

- ii. 40 units are produced. (2 Marks)

- e) Use Cramer's rule to solve the linear system:

$$0.3u - 0.2v = 0.5$$

$$0.9u - 0.6v = 0.1$$

(4 Marks)

- f) Find the sum of the first 6 terms of the G.P series: $9+3+1+\dots$. Hence compute the sum to infinity of this G.P. (4 Marks)
- g) Given that $P = \begin{bmatrix} 3 & -1 & 5 \end{bmatrix}$ and $R = \begin{bmatrix} 0 & 4 & -2 \end{bmatrix}$, find $P^T R$ (3 Marks)

QUESTION TWO

- a) Define the following terms:

(i) Identity matrix.

(2

Marks)

(ii) Determinant of a matrix.

(2

Marks)

- b) An airline company has three types of aircraft: Passenger, Transport and Jumbo. They carry three types of cargo: First class mail, Passengers and Air Freight as summarized in the table below:

<i>Units carried</i>	<i>Passenger</i>	<i>Transport</i>	<i>Jumbo</i>
<i>First Class Mail</i>	100	100	100
<i>Passengers</i>	150	20	350
<i>Air freight</i>	20	65	35

(11 Marks)

Suppose in a given day the airline must move 1100 units of first-class mail, 460 units of air freight and 1930 passengers. How many aircraft of each type should be scheduled?

QUESTION THREE

- a) Explain briefly what is meant by the following terms as used in finance.

i) Interest.

(2 Marks)

ii) Depreciation.

(2 Marks)

- b) Find the amount that will result if \$8000 is invested for $4\frac{1}{2}$ years at 8.5% compounded continuously.

(5 Marks)

- c) An asset valued at Ksh.925,700 depreciates due to wear and tear at a rate of 3.2% p.a. Suppose you were the owner of this asset and would like to dispose of it after 6 years. Which valuation method would you apply-- Straight-line method or the balance method? Why?

(6 Marks)

$x \geq 0, y \geq 0$ (9 Marks)

QUESTION FOUR.

- a) Discuss any three applications of set theory in business.(3Marks)
- b) A survey was conducted on the first 41 presidents of the United States of America. The following information was gathered:
- 8 held cabinet posts,
 - 14 served as vice-president,
 - 15 served in the U.S.A Senate,
 - 2 served in cabinet posts and as vice-president,
 - 4 served in cabinet posts and in the U.S. Senate,
 - 6 served in the U.S. Senate and as vice-president,
 - 1 served in all three positions.

Required:

- i. Draw a Venn diagram and use it to determine how many presidents served in:
(4marks)
- ii. None of these three positions?(2marks)
- iii. Only in the U.S.A Senate.
(2marks)
- iv. At least one of the three positions.
(2marks)
- v. Exactly two positions.
(2marks)

QUESTION FIVE

- a) Find the present value of Ksh.12,000 payable at the end of 4 years when the interest rate is 8% per annum. (3 Marks)
- b) An asset valued at Kshs 60,000 appreciates to a value of 110,800 in 5 years' time. Find the percentage rate of appreciation per annum. (3 Marks)
- c) Use graphical method to solve the linear program:
- Maximize $z = 16x + 24y$
- Subject to: $2x + 3y \leq 24$

$$2x + y \leq 16$$
$$y \leq 6$$