CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

ACMT 211: COMPUTATIONAL METHODS AND DATA ANALYSIS II

STREAMS: BSC. ACMT **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 16/04/2025 **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS

Question One

a) Define the following terms as they are used in trees:

i. Vertex. (2 Marks)

ii. Edge (2 Marks)

iii. Path (2 Marks)

b) Explain what is a homogeneous system of equations. Why is a homogeneous system of equations always a consistent system? (4 marks)

c)Differentiate between data cleaning and data editing? (4 marks)

d)What is a circular linked list? Differentiate between a Singly Circular Linked List and Doubly Circular Linked List. (6 marks)

e) Solve the below system of linear equations using the Gaussian Elimination method. (10 marks)

$x+2y+3z=9$

$2x+3y+z=8$

$3x+y+2z=7$

Question Two

a) Discuss any four sections of a well-designed questionnaire. (8 marks)

b) Explain the different stages of data processing in survey research. (12 marks)

Question Three

a) What function do the following strings perform? (3 marks)

i. strchr(s1, ch);

ii. strstr(s1, s2);

iii. strcmp(s1, s2);

b) What are the ethical considerations researchers must follow when conducting surveys? (8 marks)

c) Solve the below system of linear equations using the LU-Decomposition method. (9 marks)

$2x+y+3z=9$

$4x+2y+5z=21$

$6x+3y+6z=27$

Question Four

a) Differentiate between Class-limits and Class boundaries in grouped frequency tables. (4 marks)

b) List six practical applications of data structures. (6 marks)

c)Compute the Eigenvalues and eigenvectors of the below matrix. (10 marks)

A= $\begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$

Question Five

a) List and explain two non-linear data structures. (4 marks)

b) Using the c() function, write a code for creating a vector with numerics 1-5 in R. (3 marks)

c)A researcher conducted a survey to study the relationship between Gender, Age Group, and Preference for Online Shopping among 120 people. The following information was collected:

- 25 males aged 18-25 prefer online shopping.
- 15 males aged 18-25 do not prefer online shopping.
- 30 females aged 18-25 prefer online shopping.
- 10 females aged 18-25 do not prefer online shopping.

- 20 males aged 26-40 prefer online shopping.
- 10 males aged 26-40 do not prefer online shopping.
- 10 females aged 26-40 prefer online shopping.
- 5 females aged 26-40 do not prefer online shopping.
- 5 males aged 41-60 prefer online shopping.
- 5 males aged 41-60 do not prefer online shopping.
- 5 females aged 41-60 prefer online shopping.
- 10 females aged 41-60 do not prefer online shopping.

i) Create a multivariate frequency table using Gender, Age Group, and Preference for Online Shopping as the three variables. (9 marks)

Based on your table, calculate the following:

ii) The total number of males who prefer online shopping. (2 marks)

iii) The proportion of females aged 18-25 who do not prefer online shopping. (2 marks)

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