CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN COMPUTER SCIENCE

COSC 0172: MATHEMATICS FOR COMPUTING

STREAMS: DIP. COMP SCI. **TIME: 2 HOURS**

DAY/DATE: MONDAY 14/04/2025 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS

- **Answer question ONE and any other Two questions**
- **Do not write on the question paper**
- **This is a closed book exam, no reference materials are allowed in the examination room**
- **There will be No use of mobile phones or any other unauthorized materials**
- **Write your answers legibly and use your time wisely**

QUESTION ONE: (30 MARKS)

a) Obtain the remainder when $x^3 - 3x^2 + 6x + 5$ is divided by $x - 2$ using the long division method. (3 marks)

b) State without proof the remainder theorem (1 mark)

c) Show that $x + 3$ is a factor of $x^3 + 6x^2 - x - 30$ and find the remaining factors. (4 marks)

d) State 3 advantages and 3 disadvantages of arithmetic mean. (3 marks)

e) Given that $A=\begin{bmatrix}2 & 1 & 0\\ 1 & 2 & 1\\ 2 & 3 & 2\end{bmatrix}$ and $B=\begin{bmatrix}1 & 0 & 1\\ 2 & -1 & 3\\ -2 & 1 & 4\end{bmatrix}$

Find:

i) $4AB$ (3 marks)

ii) $3A + 5B$ (2 marks)

iii) $6A - 2B$ (2 marks)

iv) $A^T + B$ (3 marks)

f) Solve for x in the linear inequality $2(4x + 2) - 20 > 8(2x - 3)$. (3 marks)

g) Evaluate $4xy - 3xyz + 2yz$ given that$x = 3, y = -1, z = 2$. (2 marks)

h) Given that $f(x) = x^3 - 4x^2 - x + 4$, find $f(1)$ and $f(2)$ and hence factorize $f(x)$ into a product of 3 linear factors. (4 marks)

QUESTION TWO: (20 MARKS)

a) Given the matrix $B = \begin{bmatrix} 5 & 1 & -1 \\ 1 & -6 & 2 \\ 4 & 1 & -7 \end{bmatrix}$

Find:

i) Determinant using the Sarus method

ii) $Adj\ B$

iii) B^{-1}

iv) Hence or otherwise solve the following system of equations

$$5x + y - z = 12$$
$$x - 6y + 2z = 5$$
$$4x + y - 7z = -15$$ (15 marks)

b) The question "do you smoke?" was asked of 100 people and the results are as shown in the table

Respondents	Yes	No	Total
Male	17	40	57
Female	14	29	43
Total	31	69	100

i) What is the probability of randomly selecting an individual being a male who smoke? (1 mark)

ii) What is the probability of randomly selecting an individual being a female who don't smoke? (1 mark)

iii) What is the probability of selecting an individual who don't smoke? (1 mark)

iv) What is the probability of selecting a male or female who smoke? (1 mark)

v) What is the probability of randomly selecting a female who smoke? (1 mark)

QUESTION THREE: (20 MARKS)

a) Define the following terms

i) Square matrix (1 mark)

ii) Symmetric matrix (1 mark)

iii) Skew symmetric matrix (1 mark)

iv) Rectangular matrix (1 mark)

b) Find the mean of the data below using assumed mean method (5 marks)

Class interval	60-79	80-99	100-119	120-139	140-159
Frequency	8	16	12	8	6

c) For the following real estate prices, calculate semi-interquartile range. (5 marks)
389 950, 230 500, 479 000, 639 000, 114 950, 5 500 000, 387 000, 659 000, 529 000, 575 000, 488 800, 1 095 000.

d) Given the matrix $C = \begin{bmatrix} 7 & 3 \\ 4 & 1 \end{bmatrix}$, find C^{-1} (3 marks)

e) Solve the following simultaneous equations by use of substitution method. (3 marks)

$$2x + y - 5 = 0$$
$$6y - 4x = 12$$

QUESTION FOUR: (20 MARKS)

a) The expression $x^3 + ax - 2x - 4$ is divisible exactly by $x + 1$. Find the value of a and the remainder when the expression is divided by $2x + 1$. (4 marks)

b) State 5 properties of a good measure of central tendency. (4 marks)

c) Given that $f(x) = 2x^3 + 3x^2 - x$, $g(x) = x^4 - 2x^3 + x$ and $h(x) = x^2 + 3x - 1$ evaluate:

i) $f(x) + g(x)$

ii) $f(x) - g(x)$

iii) $f(x)g(x)$

iv) $f(x) + g(x) - h(x)$ (7 marks)

d) If we have 13 soft centered and 7 hard centered chocolates in a box and two chocolates are drawn at random to test and see if they are faulty, draw a tree diagram and use it to find the following:

i) The probability of selecting the first chocolate and getting a soft-centered (1 mark)

ii) P (Soft and soft centered) (1 mark)

iii) P (hard and soft centered) (1 mark)

iv) P (soft and hard centered) (1 mark)

v) P (Hard and soft or soft and hard) (1 mark)

QUESTION FIVE: (20 MARKS)

a) Define the following terms:

i) Mutually exclusive events (1 mark)

ii) Independent events (1 mark)

b) The following data relates to the weights of 100 children seen by a pediatric personnel Ndagani Medical clinic.

Weight (kg)	0-9	10-19	20-29	30-39	40-49	50-59
No. of Children	5	15	25	30	15	10

Calculate the:

i. Mean (2 marks)

ii. Median (3 marks)

iii. Lower quartile (2 marks)

iv. Upper quartile (2 marks)

v. Standard deviation (3 marks)

vi. Mean absolute deviation (3 marks)

vii. 80^{th} percentile (3 marks)

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