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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
FOR THE CERTIFICATE IN INFORMATION TECHNOLOGY
CIT 1003 – COMPUTATIONAL MATHEMATICS

Date: 07TH December 2023
Time: 8:30AM – 10:30AM

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS
QUESTION ONE (30 MARKS)

a) Given the matrix A= $\begin{bmatrix} 4 & 5 \\ 2 & -3 \end{bmatrix}$ Find A^{-1} (3 Marks)

b) A bag contains 5 green balls and 3 red balls, 2 balls are drawn at random. What is the probability that one is green and the other is red? (4 Marks)

c) Find the first derivative, y= $6x^{-5} + 8x - 4$ (2 Marks)

d) Solve the following quadratic equation $4x^2 - 12x + 9 = 0$ (3 Marks)

e) Use elimination method to solve the simultaneous equations (4 Marks)

$$x + y = 5$$
$$3x - 2y = 0$$

f) The following data relates to the marks of students at KWUST.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No of student	3	4	10	8	11	6

Required
Calculate the median Marks (4 Marks)

g) Convert the following number system
i) Convert 69_{10} to binary (3 Marks)
ii) Convert 10010011_2 to decimal (3 Marks)

h) Given the matrices A=$\begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$, B= $\begin{bmatrix} 5 & 3 \\ 1 & 6 \end{bmatrix}$
Determine
i) $A^T + B$ (2 Marks)
ii) AB (2 Marks)

QUESTION TWO (20 MARKS)

a) Solve the following equations

$$3x + 4y = 5$$
$$5x + 8y = 9$$

i) Elimination method (3 Marks)
ii) Substitution method (3 Marks)

b) Use matrix method to solve the following system of linear equations:

$$3x + 2y = 12$$
$$4x - y = 5$$

c) Solve the equation $x^2 - 5x + 6 = 0$
i) By formula (3 Marks)
ii) By factorization (3 Marks)

d) A bag contains 5 red, 4 white and 7 blue balls. The balls are identical in all aspect except the color. Three balls were picked at random one at a time without replacement. Determine the probability that of the three balls picked, two are blue and one white in colour. (4 Marks)

e) Convert the following number system
i) 123_8 *to decimal* (2 Marks)
ii) 450_{10} *to binay* (2 Marks)

QUESTION THREE (20 MARKS)

a) The number of days that students were missing from classes due to sickness in one year was recorded.

Number of days off sick	1-5	5-10	10-15	15-20	20-25
Frequency	12	11	10	4	3

Calculate the;
i) Mean (3 Marks)
ii) Median (4 Marks)
iii) Mode (2 Marks)
iv) Standard variation (5 Marks)
v) Co-efficient of variation (3 Marks)

b) Solve $x^2 + 6x + 9 = 0$ using factorization method. (3 Marks)

QUESTION FOUR (20 MARKS)

a) Convert each of t following number system to their respective equivalents
i) 87_{10} to binary (2 Marks)
ii) $2A5_{16}$ to decimal (2 Marks)
iii) 162_8 to decimal (2 Marks)
iv) 684_{10} to hexadecimal (2 Marks)

b) Given two matrices A and B

$$A=\begin{bmatrix} -8 & 1 \\ 2 & 4 \end{bmatrix} \quad B=\begin{bmatrix} -1 & 5 \\ 0 & -2 \end{bmatrix}$$

Determine the following;

i) Transpose of A (1 Mark)
ii) AB (3 Marks)
iii) B^T+A (2 Marks)
iv) $(BA)^{-1}$ (4 Marks)

QUESTION FIVE (20 MARKS)

a) Integrate the following functions with respect to x
i) $\int 3x^6 + 4x^{-3}\, dx$ (2 Marks)
ii) $\int 10x^7 - 5x^{-4} + 9\, dx$ (2 Marks)

b) The table below gives data on the heights, in cm, of 51 children.

Class interval	140 -150	150 - 160	160 - 170	170 -180
Frequency	6	16	**21**	8

Calculate the following,

i) Mode (3 Marks)
ii) Q_3, (3 Marks)
iii) D_4 (3 Marks)
iv) P_{40} (3 Marks)

c) Find the derivatives of the following functions
i) $y = 5x^4 + x^7 + 6$ (2 Marks)
ii) $y = (6x^3 + 10x)(x^8)$ (2 Marks)