KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS

MATH 211: LINEAR ALGEBRA I

Instructions:

- Answer question **ONE** and any other **TWO** questions
- Begin each question on a separate page
- Show your workings clearly

QUESTION ONE (30 MARKS

a) Find k so that vector **u** and **v** are orthogonal

i) U=(12,k,-32) and v = (22,-52,42) (4 marks)

ii) U=(20,30k,-40,10,50) and v = (6,-1,3,7,2k (4 marks)

b) Suppose $A=\begin{bmatrix}1 & 2\\ 3 & -4\end{bmatrix}$ and suppose $f(x)=2x^2-3x+5$, then find f(A) (5 marks)

c) Solve for x for $\begin{vmatrix}x & 2 & -1\\ 2 & 5 & x\\ -1 & 2 & x\end{vmatrix}=0$ (6 marks)

d) For the given matrices $A=\begin{pmatrix}1 & -2 & 3\\ 2 & 7 & 4\\ 3 & 1 & 4\end{pmatrix}$ $B=\begin{pmatrix}0 & 1 & 8\\ 4 & -1 & 1\\ 0 & 3 & 3\end{pmatrix}$

Show that Det(AB)=det(A)det(B) (6 marks)

e). Given $u = (6i+, 4j, -2k)$, $v = (0i+, 4j, -6k)$ and $w = (4i+, 12j+, 14k)$
$U \times (V \times W)$ (3 marks)

f). Given the matrix $\begin{bmatrix} 1 & 6 & 5 \\ 2 & 3 & 1 \\ 0 & 2 & 4 \end{bmatrix}$ calculate the determinant (4mks)

QUESTION TWO (20 MARKS)

a) Use Cramers Rule to solve for the unknown variables x_1, x_2 and x_3 given that
$12x_1 + 3x_2 + 6x_3 = 56$
$2x_1 + 7x_3 = 41$
$5x_1 + 2x_2 + 2x_3 = 34$ (10 marks)

b) Verify that the Cauchy – Schwarz inequality holds for

i) u = (15,10) and v = (20,5) (3 marks)

ii) U = (-20, 10, 5) and v = (40, -20, -20) (3 marks)

c) Show that u = (75,0,25,0,100,-25) and v = (-50,125,0,50,-75,-450) are orthogonal and verify that the pythagorean Theorem holds. (4 marks)

QUESTION THREE (20 MARKS)

a). Given the set of simultaneous equations

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

i) Use Gaussian elimination method to solve for x_1, x_2 and x_3 (13 marks)
ii) Proceed to solve for x_1, x_2 and x_3 using Gauss-Jordan Elimination method (7 marks)

QUESTION FOUR (20 MARKS)

a) Let u = (12,-32,24) and v = (32,14,17), Find
i) $\cos\theta$, $where\theta$ is the angle between u and v (4 marks)
ii) Proj(u,v), projection of u onto v (3 marks)
iii) d(u,v), the distance between u and v (2 marks)

b) Use cross product and dot product to find the angle between the vectors u = (8, 12, -24) and v = (8, 12, 24) (6 marks)

c) If $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$

Prove that A(B+C) = AB + AC (5 marks)

QUESTION FIVE (20 MARKS)

a). Find A^{-1} of the following matrix using determinant method and show that $A^{-1}A=AA^{-1}=I$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$ (20 marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

FIRST SEMESTER, 2017/2018 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE AND BACHELOR OF EDUCATION ARTS

MATH 211: LINEAR ALGEBRA I

STREAM: Y2. S 1 **TIME: 1.00-3.00 P.M**

EXAMINATION SESSION: DECEMBER **DATE: 30/11/2017**

INSTRUCTIONS

Instructions to candidates:

- **QUESTION ONE** is compulsory.
- Answer **QUESTION ONE** and any other **TWO** questions
- Begin each question on a separate page - Show your workings clearly

Question One [30 Marks]

a) Find k so that vector u and v are orthogonal

i. $u = (1, k, -3)$ and v = (2,-5,4) $v = (2, -5, 4)$ (3 marks)

ii. $u = (2, 3k, -4, 1, 5)$ and $v = (6, -1, 3, 7, 2k)$ (3 marks)

b) Find x and y given that $\begin{pmatrix} 1 & 2 \\ -3 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ (5 marks)

c) Solve for x for $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ (6 marks)

d) For the given matrices $A = \begin{pmatrix} 1 & -2 & 3 \\ 2 & 7 & 4 \\ 3 & 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 1 & 8 \\ 4 & -1 & 1 \\ 0 & 3 & 3 \end{pmatrix}$

Show that

i. $DetAB = DetA.DetB$ (6 marks)

ii. $Det(A+B) \neq DetA + DetB$ (3 marks)

e) Given $u = (6, 4, -2)$ $v = (0, 4, -6)$ and $w = (4, 12, 14)$ find

i. $v \times w$ (3 marks)

ii. $u \times (v \times w)$ (3 marks)

iii. $(u \times v)(v \times w)$ (3 marks)

QUESTION TWO (20 MARKS)

a) Use Cramer's Rule to solve for the unknown variables x, y and z given that

$$\begin{aligned} 10x + 3y + 6z &= 76 \\ 4x + \quad\quad 5z &= 41 \\ 5x + 2y + 2z &= 34 \end{aligned}$$

(10 marks)

b) Verify that the Cauchy – Schwarz inequality holds for

i) $u = (75, 50)$ and v = (100,25) (3 marks)

ii) $u = (-80, 40, 20)$ and $v = (160, -80, -80)$ (3 marks)

c) Show that $u = (75, 0, 25, 0, 100, -25)$ and $v = (-50, 125, 0, 50, -75, -450)$ are orthogonal and verify that the Pythagorean Theorem holds. (4 marks)

QUESTION THREE (20 MARKS)

Given the set of simultaneous equations

$$\begin{aligned} 3x + 4y + 9z &= 45 \\ 4x + 5y + 2z &= 32 \\ 4x + 2y + 4z &= 32 \end{aligned}$$

i. Use Gaussian elimination method to solve for x, y and z (13 marks)

ii. Proceed to solve for x, y and z using Gauss-Jordan Elimination method (7 marks)

QUESTION FOUR (20 MARKS)

a) Let $a = (1, -3, 4)$ and $b = (3, 4, 7)$

Find

i. $\cos\theta$, where θ is the angle between a and b (4 marks)

ii. $proj.(a, b)$, projection of a onto b (3 marks)

iii. $d(a, b)$, the distance between a and b (2 marks)

b) Use cross product and dot product to find the sine of the angle between the vectors $u = (8, 12, -24)$ and $v = (8, 12, 24)$ (6 marks)

c) Given that $A = \begin{pmatrix} 1 & 2 \\ 3 & -1 \end{pmatrix}$ $B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ $C = \begin{pmatrix} 2 & 1 \\ -1 & 1 \end{pmatrix}$

Show that $A(B + C) = (A + B)C$ (5marks)

QUESTION FIVE (20 MARKS)

Find A^{-1} of the following matrix using determinant method and show that $A^{-1}A = AA^{-1} = I$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$ (20Marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

FIRST SEMESTER, 2017/2018 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE AND BACHELOR OF EDUCATION ARTS

MATH 211: LINEAR ALGEBRA I

STREAM: Y2. S 1 **TIME: 1.00-3.00 P.M**

EXAMINATION SESSION: DECEMBER **DATE: 30/11/2017**

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- **QUESTION ONE** is compulsory.
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Question One [30 Marks]

a) Find k so that vector u and v are orthogonal

i. $u = (1,\ k, -3)$ and v = (2,-5,4) $v = (2,\ -5,\ 4)$ (3 marks)

ii. $u = (2,\ 3k, -4,\ 1,\ 5)$ and $v = (6,\ -1,\ 3,\ 7,\ 2k)$ (3 marks)

b) Find x and y given that $\begin{pmatrix} 1 & 2 \\ -3 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ (5 marks)

c) Solve for x for $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ (6 marks)

d) For the given matrices $A = \begin{pmatrix} 1 & -2 & 3 \\ 2 & 7 & 4 \\ 3 & 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 1 & 8 \\ 4 & -1 & 1 \\ 0 & 3 & 3 \end{pmatrix}$

Show that

i. $DetAB = DetA.DetB$ (6 marks)

ii. $Det(A+B) \neq DetA + DetB$ (3 marks)

e) Given $u = (6,\ 4, -2)$ $v = (0,\ 4, -6)$ and $w = (4,\ 12,\ 14)$ find

i. $v \times w$ (3 marks)

ii. $u \times (v \times w)$ (3 marks)

iii. $(u \times v)(v \times w)$ (3 marks)

QUESTION TWO (20 MARKS)

a) Use Cramer's Rule to solve for the unknown variables x, y and z given that

$$\begin{aligned} 10x + 3y + 6z &= 76 \\ 4x + \qquad 5z &= 41 \\ 5x + 2y + 2z &= 34 \end{aligned}$$

(10 marks)

b) Verify that the Cauchy – Schwarz inequality holds for

i) $u = (75,\ 50)$ and v = (100,25) (3 marks)

ii) $u = (-80,\ 40,\ 20)$ and $v = (160,\ -80, -80)$ (3 marks)

c) Show that $u = (75,\ 0,\ 25,\ 0,\ 100,\ -25)$ and $v = (-50,\ 125,\ 0,\ 50,\ -75,\ -450)$ are orthogonal and verify that the Pythagorean Theorem holds. (4 marks)

QUESTION THREE (20 MARKS)

Given the set of simultaneous equations

$$\begin{aligned} 3x + 4y + 9z &= 45 \\ 4x + 5y + 2z &= 32 \\ 4x + 2y + 4z &= 32 \end{aligned}$$

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QUESTION FOUR (20 MARKS)

a) Let $a = (1, -3, 4)$ and $b = (3, 4, 7)$

Find

i. $\cos\theta$, where θ is the angle between a and b (4 marks)

ii. $proj.(a, b)$, projection of a onto b (3 marks)

iii. $d(a, b)$, the distance between a and b (2 marks)

b) Use cross product and dot product to find the sine of the angle between the vectors $u = (8, 12, -24)$ and $v = (8, 12, 24)$ (6 marks)

c) Given that $A = \begin{pmatrix} 1 & 2 \\ 3 & -1 \end{pmatrix}$ $B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ $C = \begin{pmatrix} 2 & 1 \\ -1 & 1 \end{pmatrix}$

Show that $A(B+C) = (A+B)C$ (5marks)

QUESTION FIVE (20 MARKS)

Find A^{-1} of the following matrix using determinant method and show that $A^{-1}A = AA^{-1} = I$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$ (20Marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

SECOND SEMESTER, 2017/2018 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS; ECONOMICS AND STATISTICS AND ACTUARIAL SCIENCES

MATH 211: LINEAR ALGEBRA I

STREAM: [Y2S1 &Y3S1] **TIME: 2:00-4.00P.M**

EXAMINATION SESSION: APRIL **DATE: 17/04/2018**

INSTRUCTIONS

- Instructions to candidates: Answer **QUESTION ONE** and any other **TWO** questions
- Do not write on the question paper
- Follow instruction that are given on the answer sheet

QUESTION 1 (30 MARKS)

a) For the 3×3 matrix $A = \begin{bmatrix} 2 & 7 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$, use row reduction to find A^{-1} (8 marks)

b) Find the area of a parallelogram whose adjacent sides are the vectors $\underset{\sim}{u} = (4,-1,2)$ and $\underset{\sim}{v} = (6,-1,6)$. (2 marks)

Given the set $S = \{(1,2,3),\ (0,1,2), (-1,0,1)\}$, show that V=(1,-2,2) is not a linear combination of vectors in S. (5 marks)

c) Given that $s = \{(-4,3,4), (1,-2,3), (6,0,0)\}$. Find if s is linearly independent set of vectors in R^3 (5 marks)

d) Define a linear dependent vector space (4 marks)

e) Find the dimension of W dim(w) where $w = \{\alpha, \beta - \alpha, \beta; \beta, \alpha \in R^3\}$ (6 marks)

QUESTION 2 (20 MARKS)

a) Use Gauss–Jordan method elimination process to solve the following system of linear equations:

$$2x_1 + 3x_2 + x_3 = 6$$
$$3x_1 + 2x_2 - 4x_3 = 12 \qquad \text{(6 marks)}$$
$$x_1 - 2x_2 + 3x_3 = -3$$

b) Use the row echelon form to solve the following system of linear equations:

$$x_1 + 2x_2 - 7x_3 = -4$$
$$2x_1 + x_2 + x_3 = -13 \qquad \text{(8 marks)}$$
$$3x_1 + 9x_2 - 36x_3 = -33$$

c) For what values of does the homogenous system below have non- trivial solutions

$kx + y - 3x = 0$

$x + ky - 3y = 0$ (6 marks)

QUESTION 3 (20 MARKS)

For the matrix $B = \begin{bmatrix} 2 & -1 & 1 \\ 1 & -2 & 1 \\ 1 & -3 & 2 \end{bmatrix}$ and $A = \begin{bmatrix} 2 & 7 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$

i) Show that $AB \neq BA$ (4 marks)

ii) Find $A + B, A - B$. (6 marks)

b) Find the area of a triangle with vertices at points $A(1,0), B(2,2), C(4,3)$

(6 marks)

c) Use the determinate on matrix method to get the equation a line that have collinear points given as $A(1,8), B(-2,1)$ (4 Marks)

QUESTION 4 (20 MARKS)

a) Use the inverse method to solve the system below,

$$2x_1 + 2x_2 - x_3 = 1$$
$$3x_1 + 5x_2 + 2x_3 = 8$$
$$-x_1 + 2x_2 + 3x_3 = 1 \qquad \text{(9 marks)}$$

b) i) Define the term basis$S$ of a vector space V. (1 mark)

ii) Show that the set $S = \{\tilde{u}_1 = (1,0,-1), \tilde{u}_2 = (1,2,1), \tilde{u}_3 = (0,-3,2)\}$forms a basis for the vector space $\mathbb{R}^3$ (5 marks)

i) Express vector $\tilde{\boldsymbol{v}} = (\mathbf{3}, -\mathbf{5}, \mathbf{7})$ as a linear combination of vectors in $\boldsymbol{S}$. (5 marks)

QUESTION 5 (20 MARKS)

a) Given the vectors $\tilde{\boldsymbol{u}} = (\mathbf{2}, \mathbf{1}, -\mathbf{3})$ and $\tilde{\boldsymbol{v}} = (-\mathbf{1}, \mathbf{5}, -\mathbf{4})$, find:
   i) the orthogonal projection of $\tilde{\boldsymbol{v}}$ on $\tilde{\boldsymbol{u}}$ (6 marks)
   ii) the angle $\boldsymbol{\theta}$ between $\tilde{\boldsymbol{u}}$ and $\tilde{\boldsymbol{v}}$ (6 marks)

b) If $\tilde{\boldsymbol{u}}$ and $\tilde{\boldsymbol{v}}$ are vectors in R^3, using the vector components of $\tilde{\boldsymbol{u}}$ and $\tilde{\boldsymbol{v}}$, show that:
   i) $\tilde{\boldsymbol{v}} \bullet (\tilde{\boldsymbol{u}} \times \tilde{\boldsymbol{v}}) = \mathbf{0}$ (3 marks)

c) Use Cramer's rule to solve the system below

$$\begin{aligned} \boldsymbol{x_1} + \mathbf{2}\boldsymbol{x_2} - \boldsymbol{x_3} &= \mathbf{1} \\ \mathbf{2}\boldsymbol{x_1} + \boldsymbol{x_2} + \mathbf{4}\boldsymbol{x_3} &= \mathbf{2} \\ \mathbf{3}\boldsymbol{x_1} + \mathbf{3}\boldsymbol{x_2} + \mathbf{4}\boldsymbol{x_3} &= \mathbf{1} \end{aligned}$$

(5 marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS
MAIN CAMPUS

FIRST SEMESTER, 2017 ACADEMIC YEAR
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN EDUCATION

MATH 211: LINEAR ALGEBRA I

STREAM: (PART TIME) **TIME: 11-1PM**

EXAMINATION SESSION: APRIL **DATE: 14/04/2017**

Instructions:
- Answer question **ONE** and any other **TWO** questions
- Begin each question on a separate page
- Show your workings clearly 1

QUESTION ONE (30 MARKS

a) $A=\begin{bmatrix}1 & 2\\ 1 & 3\end{bmatrix}$ $B=\begin{bmatrix}3 & 2\\ 2 & 2\end{bmatrix}$

Show that $(AB)^{-1}=A^{-1}B^{-1}$ (6 marks)

b) Given that $A=\begin{bmatrix}-1 & 2\\ 0 & 3\end{bmatrix}$. Calculate $p(x)=2x^2-3x+4$ (5 marks)

c) Find the components of vector $v=p_1p_2$ with initial point $p_1(2,-1,4)$ and terminal point $p_2(7,5,-8)$ (3 marks)

d) Given $u=(3,2,-1)$, $v=(0,2,-3)$ *and* $w=(2,6,7)$

i) V X W (3 marks)

ii) U X (V X W) (3 marks)

iii) (U X V) X (V X W) (3 marks)

iv) U X (V – 2W) (3 marks)

e) If u = (1, 3, -2, 7) and v = (0, 7, 2, 2). Find the Euclidean space R^4 (3 marks)

QUESTION TWO (20 MARKS)

Given the following system of equations

x + y – z – 4 = 0

2x – 3y + 4z – 33 = 0

3x –2y – 2z -2 = 0

Solve these systems of equations using

i) Gaussian elimination and Gauss-Jordan Elimination methods (10 marks)

ii) Cramers Rule (10 marks)

QUESTION THREE (20 MARKS)

a) If **u** and **a** are vectors in 2 or 3 space and if $a \neq 0$. Proof that

i) $proj_a u = \frac{u.a}{\|a\|^2}.a$ (Vector component of u along a) (4 marks)

ii) $u - proj_a u = u - \frac{u.a}{\|a\|^2}.a$ (Vector component of u orthogonal to a)

(4 marks)

b) Let u = (2, -1, 3) and **a** = (4, -1, 2) .
Find

i) The vector component of **u** along **a** (3 marks)

ii) The vector component of **u** orthogonal to **a** (3 marks)

c) Use cross product to find the sine of the angle between the vectors u = (2, 3, -6) and v = (2, 3, 6) (6 marks)

QUESTION FOUR (20 MARKS)

a) Obtain the inverse of the following matrix using row reduction method

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{pmatrix}$$ (10 marks)

b) Obtain the inverse of the following matrix using determinant method

$$A = \begin{pmatrix} 3 & 2 & -1 \\ 1 & 6 & 3 \\ 2 & -4 & 0 \end{pmatrix}$$ (10 marks)

QUESTION FIVE (20 MARKS)

a) Let $u = (u_1, u_2, u_3)$ and $v = (v_1, v_2, v_3)$ be two nonzero vectors. If θ is the angle between u and v. Show that $u.v = u_1v_1 + u_2v_2 + u_3v_3$ (6 marks)

b) Let $u = (u_1, u_2, u_3, ...u_n)$ and $v = (v_1, v_2, v_3, ...v_n)$ are vectors in R^n. Show that $|u.v| \le \|u\| \, \|v\|$ (4 marks)

c) Verify that the Cauchy – Schwarz inequality holds for

i) u = (3, 2) and v = (4,1) (3 marks)

ii) U = (-4, 2, 1) and v = (8, -4, -4) (3 marks)

d) Given u = (-3, 2, 1, 0), v = (4, 7, -3, 2) and w = (5, -2, 8, 1). Find

i) 2u + 7v (2 marks)

ii) (6v – w) - (4u +v) (2 marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

SECOND SEMESTER, 2017/2018 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS; ECONOMICS AND STATISTICS AND ACTUARIAL SCIENCES

MATH 211: LINEAR ALGEBRA I

STREAM: [Y2S1 &Y3S1] **TIME: 2:00-4.00P.M**

EXAMINATION SESSION: APRIL **DATE: 17/04/2018**

INSTRUCTIONS

- Instructions to candidates: Answer **QUESTION ONE** and any other **TWO** questions
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QUESTION 1 (30 MARKS)

a) For the 3×3 matrix $A = \begin{bmatrix} 2 & 7 & 1 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$, use row reduction to find A^{-1} (8 marks)

b) Find the area of a parallelogram whose adjacent sides are the vectors $\underset{\sim}{u} = (4, -1, 2)$ and $\underset{\sim}{v} = (6, -1, 6)$. (2 marks)

Given the set $S = \{(1,2,3),\ (0,1,2), (-1,0,1)\}$, show that V=(1,-2,2) is not a linear combination of vectors in S. (5 marks)

c) Given that $s = \{(-4,3,4), (1,-2,3), (6,0,0)\}$. Find if s is linearly independent set of vectors in R^3 (5 marks)

d) Define a linear dependent vector space

(4 marks)

e) Find the dimension of W dim(w) where $w = \{\alpha, \beta - \alpha, \beta; \beta, \alpha \in R^3)$

(6 marks)

QUESTION 2 (20 MARKS)

a) Use Gauss–Jordan method elimination process to solve the following system of linear equations:

$$2x_1+3x_2+x_3=6$$
$$3x_1+2x_2-4x_3=12 \qquad \text{(6 marks)}$$
$$x_1-2x_2+3x_3=-3$$

b) Use the row echelon form to solve the following system of linear equations:

$$x_1+2x_2-7x_3=-4$$
$$2x_1+x_2+x_3=-13 \qquad \text{(8 marks)}$$
$$3x_1+9x_2-36x_3=-33$$

c) For what values of does the homogenous system below have non- trivial solutions

$kx+y-3x=0$

$x+ky-3y=0$ (6 marks)

QUESTION 3 (20 MARKS)

For the matrix $B=\begin{bmatrix}2 & -1 & 1\\ 1 & -2 & 1\\ 1 & -3 & 2\end{bmatrix}$ and $A=\begin{bmatrix}2 & 7 & 1\\ 1 & 1 & 1\\ 0 & 1 & 1\end{bmatrix}$

i) Show that $AB\neq BA$ (4 marks)

ii) Find $A+B, A-B$. (6 marks)

b) Find the area of a triangle with vertices at points $A(1,0), B(2,2), C(4,3)$

(6 marks)

c) Use the determinate on matrix method to get the equation a line that have collinear points given as $A(1,8), B(-2,1)$ (4 Marks)

QUESTION 4 (20 MARKS)

a) Use the inverse method to solve the system below,

$$2x_1+2x_2-x_3=1$$
$$3x_1+5x_2+2x_3=8$$
$$-x_1+2x_2+3x_3=1 \qquad \text{(9 marks)}$$

b) i) Define the term basis$S$ of a vector space V. (1 mark)

ii) Show that the set $S=\{\tilde{u}_1=(1,0,-1), \tilde{u}_2=(1,2,1), \tilde{u}_3=(0,-3,2)\}$forms a basis for the vector space $\mathbb{R}^3$ (5 marks)

i) Express vector $\tilde{\boldsymbol{v}} = (\mathbf{3}, -\mathbf{5}, \mathbf{7})$ as a linear combination of vectors in $\boldsymbol{S}$. (5 marks)

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a) Given the vectors $\tilde{\boldsymbol{u}} = (\mathbf{2}, \mathbf{1}, -\mathbf{3})$ and $\tilde{\boldsymbol{v}} = (-\mathbf{1}, \mathbf{5}, -\mathbf{4})$, find:

   i) the orthogonal projection of $\tilde{\boldsymbol{v}}$ on $\tilde{\boldsymbol{u}}$ (6 marks)

   ii) the angle $\boldsymbol{\theta}$ between $\tilde{\boldsymbol{u}}$ and $\tilde{\boldsymbol{v}}$ (6 marks)

b) If $\tilde{\boldsymbol{u}}$ and $\tilde{\boldsymbol{v}}$ are vectors in R^3, using the vector components of $\tilde{\boldsymbol{u}}$ and $\tilde{\boldsymbol{v}}$, show that:

   i) $\tilde{\boldsymbol{v}} \bullet (\tilde{\boldsymbol{u}} \times \tilde{\boldsymbol{v}}) = \mathbf{0}$ (3 marks)

c) Use Cramer's rule to solve the system below

$$\begin{aligned} \boldsymbol{x_1} + \mathbf{2}\boldsymbol{x_2} - \boldsymbol{x_3} &= \mathbf{1} \\ \mathbf{2}\boldsymbol{x_1} + \boldsymbol{x_2} + \mathbf{4}\boldsymbol{x_3} &= \mathbf{2} \\ \mathbf{3}\boldsymbol{x_1} + \mathbf{3}\boldsymbol{x_2} + \mathbf{4}\boldsymbol{x_3} &= \mathbf{1} \end{aligned}$$

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KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

FIRST SEMESTER, 2017/2018 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE AND BACHELOR OF EDUCATION ARTS

MATH 211: LINEAR ALGEBRA I

STREAM: Y2. S 1 **TIME:** 1.00-3.00 P.M

EXAMINATION SESSION: DECEMBER **DATE:** 30/11/2017

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Question One [30 Marks]

a) Find k so that vector u and v are orthogonal

i. $u = (1, k, -3)$ and v = (2,-5,4) $v = (2, -5, 4)$ (3 marks)

ii. $u = (2, 3k, -4, 1, 5)$ and $v = (6, -1, 3, 7, 2k)$ (3 marks)

b) Find x and y given that $\begin{pmatrix} 1 & 2 \\ -3 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ (5 marks)

c) Solve for x for $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ (6 marks)

d) For the given matrices $A = \begin{pmatrix} 1 & -2 & 3 \\ 2 & 7 & 4 \\ 3 & 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 1 & 8 \\ 4 & -1 & 1 \\ 0 & 3 & 3 \end{pmatrix}$

Show that

i. $DetAB = DetA.DetB$ (6 marks)

ii. $Det(A+B) \neq DetA + DetB$ (3 marks)

e) Given $u = (6,\ 4, -2)$ $v = (0,\ 4, -6)$ and $w = (4,\ 12,\ 14)$ find

i. $v \times w$ (3 marks)

ii. $u \times (v \times w)$ (3 marks)

iii. $(u \times v)(v \times w)$ (3 marks)

QUESTION TWO (20 MARKS)

a) Use Cramer's Rule to solve for the unknown variables x, y and z given that

$$\begin{aligned} 10x + 3y + 6z &= 76 \\ 4x + \quad\quad 5z &= 41 \\ 5x + 2y + 2z &= 34 \end{aligned}$$

(10 marks)

b) Verify that the Cauchy – Schwarz inequality holds for

i) $u = (75,\ 50)$ and v = (100,25) (3 marks)

ii) $u = (-80,\ 40,\ 20)$ and $v = (160,\ -80, -80)$ (3 marks)

c) Show that $u = (75,\ 0,\ 25,\ 0,\ 100,\ -25)$ and $v = (-50,\ 125,\ 0,\ 50,\ -75,\ -450)$ are orthogonal and verify that the Pythagorean Theorem holds. (4 marks)

QUESTION THREE (20 MARKS)

Given the set of simultaneous equations

$$\begin{aligned} 3x + 4y + 9z &= 45 \\ 4x + 5y + 2z &= 32 \\ 4x + 2y + 4z &= 32 \end{aligned}$$

i. Use Gaussian elimination method to solve for x, y and z (13 marks)

ii. Proceed to solve for x, y and z using Gauss-Jordan Elimination method (7 marks)

QUESTION FOUR (20 MARKS)

a) Let $a = (1, -3, 4)$ and $b = (3, 4, 7)$

Find

i. $\cos\theta$, where θ is the angle between a and b (4 marks)

ii. $proj.(a, b)$, projection of a onto b (3 marks)

iii. $d(a, b)$, the distance between a and b (2 marks)

b) Use cross product and dot product to find the sine of the angle between the vectors $u = (8, 12, -24)$ and $v = (8, 12, 24)$ (6 marks)

c) Given that $A = \begin{pmatrix} 1 & 2 \\ 3 & -1 \end{pmatrix}$ $B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ $C = \begin{pmatrix} 2 & 1 \\ -1 & 1 \end{pmatrix}$

Show that $A(B + C) = (A + B)C$ (5marks)

QUESTION FIVE (20 MARKS)

Find A^{-1} of the following matrix using determinant method and show that $A^{-1}A = AA^{-1} = I$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$ (20Marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND SEMESTER, 2018/2019 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF (BSC) IN COMPUTER SCIENCE, ECONOMICS&MATHEMATICS AND EDUCATION SCIENCE

MATH 211: LINEAR ALGEBRA I

STREAM: Y2S1 **TIME: 2.00-4.00 PM**

EXAMINATION SESSION: JAN-APRIL **YEAR: 9/04/2019**

VENUE:AUDIT **COPIES: 70**

INSTRUCTIONS:

Attempt Question ONE and any other TWO Questions

QUESTION ONE (20 MARKS)

a) Solve the following system.

$$-2x_1 + 3x_2 = 1$$

$$6x_1 - 9x_2 = 2$$ **(4Mks)**

b) Evaluate each of the following for the given matrix

$$A = \begin{bmatrix} -7 & 3 \\ 5 & 1 \end{bmatrix}$$

i. A^2 (2mks)

ii. A^3 (2mks)

iii. $P(A)$ where $p(x) = -6x^3 + 10x - 9$ **(5mks)**

c) Find the determinant and the inverses of the following matrices

(i) $A = \begin{bmatrix} 3 & 9 & 2 \\ 0 & 0 & 0 \\ -4 & -5 & 1 \end{bmatrix}$ **(7mks)**

(d) Given the vectors A=2i+3j+k and B=i+2i+4k find

i) A.B (3mks)

ii) AXB **(3mks)**

e). Suppose B = $\begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is symmetric. Find x and B (4mks)

QUESTION TWO (20MARKS)

a) Define an orthogonal matrix. (2marks)

b) Find the diagonal and trace of the following square matrix. (4marks)

A = $\begin{bmatrix} 2 & -5 & 8 \\ 3 & -6 & -7 \\ 4 & 0 & -1 \end{bmatrix}$

c) Let A = $\begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$ and let f(x) = $2x^3 - 4x + 5$ and g(x) = $x^2 + 2x + 11$.

Find, (i) A^2 (ii) A^3 (iii) f(A) (iv) g(A) (9marks)

c) Given that B = $\begin{pmatrix} 5 & 1 \\ 3 & 4 \end{pmatrix}$, find the inverse of matrix B and show that $B^{-1}B = BB^{-1} = 1$ (5marks)

QUESTION THREE (20 MARKS)

a) Given the system of linear Equations below solve the system by

(i) Gauss-Jordan elimination method **(10 mks)**

(ii) Cramer's Rule **(10 mks)**

$$4x_1 - 8x_2 - 4x_3 = 4$$

$$x_1 + x_2 + 3x_3 = 3$$

$$2x_1 - 2x_2 + 2x_3 = 2$$

Comment briefly on your answer

QUESTION FOUR (20 MARKS)

a) Let A = $\begin{bmatrix} \mathbf{5} & \mathbf{2} \\ \mathbf{0} & \boldsymbol{k} \end{bmatrix}$. Find all numbers k for which A is a root of the polynomial,

f(x) = x^2 -7x +10 (4marks)

a) Given that A = $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $and\ B = \begin{pmatrix} 1 & 1 \\ 0 & 2 \end{pmatrix}$ determine C = 2(B +A) – (2A + 2B + B) (6marks)

b) Given that **a** = $\begin{pmatrix} \mathbf{3} \\ \mathbf{2} \\ \mathbf{7} \end{pmatrix}$ **and b** = $\begin{pmatrix} \mathbf{2} \\ \mathbf{4} \\ \mathbf{-2} \end{pmatrix}$ find

(i) **a . b** (4marks)

(ii) **a x b** (6marks)

QUESTION FIVE (20 MARKS)

a) What is a vector space?. State any of its two axioms. (3mks)

b) Given that V = $R^3$and w = (a,b,0); a,b are real numbers. Determine if W is a subspace of R^3 (5mks)

c) Given that V = P_3 w = (P(x) =a_1x + a_2x^2+ a_3x^3). Determine if W is a subspace of P_3

(5mks)

d). $If\ A=\begin{bmatrix} 4 & 0 \\ 1 & -2 \end{bmatrix}$ then prove that $A^2 - 2A - 8I = 0$ where zero is a null matrix (5mks)

e). Find k so that vector **u** and **v** are orthogonal for u=(9, 9k, -27) and v = (18, -45, 36) (2mks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

FIRST SEMESTER 2018/2019 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION ARTS/SCIENCE, COMPUTER SCIENCE; MATHEMATICS AND ECONOMICS; ECONOMICS AND STATISTICS; ACTUARIAL SCIENCES.

MATH 211: Linear algebra I

EXAMINATION SESSION:DEC **DATE:26/11/2018**

YEAR: Y2S1 **TIME 2:00-4:00**

VENUE:SMHS **COPIES:210**

Instructions to Candidates
1. Time allowed: 2 hours
2. This paper consists of FIVE questions.
3. Attempt QUESTION ONE and any other TWO
4. Start each question on a fresh page.
5. Indicate question numbers clearly at the top of each page.
6. Observe further instructions from the booklet

QUESTION ONE (30MARKS)

a) Find x and y given that,

$$\begin{pmatrix} 1 & 2 \\ -3 & 7 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$ (5marks)

b) Use Cramer's rule to solve for the unknown variables x , y and z given that,

10x + 3y + 6z = 76

$4x + 5z = 41$

$5x + 2y + 2z = 34$ (10marks)

c) Compute A^{-1} using cofactor method given that

$$\begin{pmatrix} 1 & 2 & -4 \\ -1 & -1 & 5 \\ 2 & 7 & -3 \end{pmatrix}$$ (8marks)

d) Use Gauss – Jordan elimination process to solve the following systems of linear equations. (7marks)

$2x_1 - x_3 = 3$

$X_1 + x_2 + 4x_3 = 0$

$3x_1 + 2x_2 - x_3 = 1$

QUESTION TWO (20MARKS)

a) If $A = \begin{pmatrix} 2 & -5 & 7 \\ -3 & 2 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 7 & -2 \\ 3 & -2 & -4 \end{pmatrix}$, find

(i) $A + B$ (2marks)

(ii) $A - B$ (2marks)

b) Let $\mathbf{a} = \begin{pmatrix} \mathbf{2} \\ \mathbf{-2} \\ \mathbf{4} \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -5 \\ 1 \\ 2 \end{pmatrix}$, $\mathbf{c} = \begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$

find (i) the magnitude of **d** given that $\mathbf{d} = 2\mathbf{a} + 3\mathbf{b} - \mathbf{c}$ (3marks)

(ii) the dot and cross product of **b** and **c.** (8marks)

c) Given that $B = \begin{pmatrix} 5 & 1 \\ 3 & 4 \end{pmatrix}$, find the inverse of matrix B and show that $B^{-1}B = BB^{-1} = 1$ (5marks)

QUESTION THREE (20MARKS)

a) Find k so that vectors **u** and **v** are orthogonal.

(i) **U** = (12 , k , -32) and **V** = (22 , -52 , 42) (3marks)

(ii) **U** = (20 , 30k , -40 , 10 , 50) and **V** = (6 , -1 , 3 , 7 , 2k) (3marks.

b) Suppose A = $\begin{pmatrix} 1 & 2 \\ 3 & -4 \end{pmatrix}$ and suppose ,

$f(x) = 2x^2 - 3x + 5$, then find f(A) (5marks)

c) Solve for x for ,

$$\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$$ (6marks)

d) For the given matrices,

A = $\begin{pmatrix} 1 & -2 & 3 \\ 2 & 7 & 4 \\ 3 & 1 & 4 \end{pmatrix}$ B = $\begin{pmatrix} 0 & 1 & 8 \\ 4 & -1 & 1 \\ 0 & 3 & 3 \end{pmatrix}$ show that Det(AB) = det (A) det(B) (6marks)

QUESTION FOUR (20MARKS)

a) (i) Define an orthogonal matrix A. (2marks)

(ii) Verify that A = $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ is an orthogonal matrix. (3marks)

b) Given the following matrix A = $\begin{pmatrix} 2 & 7 & 1 \\ 1 & 4 & -1 \\ 1 & 3 & 0 \end{pmatrix}$

Find (i) det A (3marks)

(ii) Inverse of A. (6marks)

c) Use Cramer's Rule to solve the following systems of equations, (6marks)

$-x + 2y - 3z = 1$

$2x + z = 0$

$3x - 4y - 4z = 2$

QUESTION FIVE (20MARKS)

a) Given that $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $and\ B = \begin{pmatrix} 1 & 1 \\ 0 & 2 \end{pmatrix}$ determine C = 2(B +A) – (2A + 2B + B) (6marks)

b) Given that $\mathbf{a} = \begin{pmatrix} \mathbf{3} \\ \mathbf{2} \\ \mathbf{7} \end{pmatrix}$ **and** $\mathbf{b} = \begin{pmatrix} \mathbf{2} \\ \mathbf{4} \\ \mathbf{-2} \end{pmatrix}$ find

(i) **a . b** (4marks)

(ii) **a x b** (6marks)

c) Find the distance between the following pair of points P(-3 , 1 , 2) and Q(7 , 5 , 2) (4marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND MATHEMATICS

MATH 211: LINEAR ALGEBRA I

Instructions:
- Answer question **ONE** and any other **TWO** questions
- Begin each question on a separate page
- Show your workings clearly

QUESTION ONE (30 MARKS

a) Find k so that vector **u** and **v** are orthogonal

i) U=(12,k,-32) and v = (22,-52,42) (4 marks)

ii) U=(20,30k,-40,10,50) and v = (6,-1,3,7,2k (4 marks)

b) Suppose $A = \begin{bmatrix} 1 & 2 \\ 3 & -4 \end{bmatrix}$ and suppose $f(x) = 2x^2 - 3x + 5$, then find f(A) (5 marks)

c) Solve for x for $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$ (6 marks)

d) For the given matrices $A = \begin{pmatrix} 1 & -2 & 3 \\ 2 & 7 & 4 \\ 3 & 1 & 4 \end{pmatrix} B = \begin{pmatrix} 0 & 1 & 8 \\ 4 & -1 & 1 \\ 0 & 3 & 3 \end{pmatrix}$

Show that Det(AB)=det(A)det(B) (6 marks)

e). Given $u = (6i+, 4j, -2k),\ v = (0i+, 4j, -6k)\ \ and\ \ w = (4i+, 12j+, 14k)$
$U \times (V \times W)$ (3 marks)

f). Given the matrix $\begin{bmatrix} 1 & 6 & 5 \\ 2 & 3 & 1 \\ 0 & 2 & 4 \end{bmatrix}$ calculate the determinant (4mks)

QUESTION TWO (20 MARKS)

a) Use Cramers Rule to solve for the unknown variables x_1, x_2 and x_3 given that
$12x_1 + 3x_2 + 6x_3 = 56$
$2x_1 + 7x_3 = 41$
$5x_1 + 2x_2 + 2x_3 = 34$ (10 marks)

b) Verify that the Cauchy – Schwarz inequality holds for

i) u = (15,10) and v = (20,5) (3 marks)

ii) U = (-20, 10, 5) and v = (40, -20, -20) (3 marks)

c) Show that u = (75,0,25,0,100,-25) and v = (-50,125,0,50,-75,-450) are orthogonal and verify that the pythagorean Theorem holds. (4 marks)

QUESTION THREE (20 MARKS)

a). Given the set of simultaneous equations

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

i) Use Gaussian elimination method to solve for x_1, x_2 and x_3 (13 marks)
ii) Proceed to solve for x_1, x_2 and x_3 using Gauss-Jordan Elimination method (7 marks)

QUESTION FOUR (20 MARKS)

a) Let u = (12,-32,24) and v = (32,14,17), Find
   i) $\cos\theta,\ where\,\theta$ is the angle between u and v (4 marks)
   ii) Proj(u,v), projection of u onto v (3 marks)
   iii) d(u,v), the distance between u and v (2 marks)

b) Use cross product and dot product to find the angle between the vectors u = (8, 12, -24) and v = (8, 12, 24) (6 marks)

c) If $A = \begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$

Prove that A(B+C) = AB + AC (5 marks)

QUESTION FIVE (20 MARKS)

a). Find A^{-1} of the following matrix using determinant method and show that $A^{-1}A=AA^{-1}=I$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$ (20 marks)

KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

FIRST SEMESTER, 2017 ACADEMIC YEAR
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN EDUCATION

MATH 211: LINEAR ALGEBRA I

STREAM: (PART TIME) **TIME: 11-1PM**

EXAMINATION SESSION: APRIL **DATE: 14/04/2017**

Instructions:

- Answer question **ONE** and any other **TWO** questions
- Begin each question on a separate page
- Show your workings clearly 1

QUESTION ONE (30 MARKS

a) $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 2 \\ 2 & 2 \end{bmatrix}$

Show that $(AB)^{-1} = A^{-1}B^{-1}$ (6 marks)

b) Given that $A = \begin{bmatrix} -1 & 2 \\ 0 & 3 \end{bmatrix}$. Calculate $p(x) = 2x^2 - 3x + 4$ (5 marks)

c) Find the components of vector $v = p_1 p_2$ with initial point $p_1(2,-1,4)$ and terminal point $p_2(7,5,-8)$ (3 marks)

d) Given $u = (3,2,-1)$, $v = (0,2,-3)$ *and* $w = (2,6,7)$

i) V X W (3 marks)
ii) U X (V X W) (3 marks)

iii) (U X V) X (V X W) (3 marks)

iv) U X (V – 2W) (3 marks)

e) If u = (1, 3, -2, 7) and v = (0, 7, 2, 2). Find the Euclidean space R^4 (3 marks)

QUESTION TWO (20 MARKS)

Given the following system of equations

x + y – z – 4 = 0

2x – 3y + 4z – 33 = 0

3x –2y – 2z -2 = 0

Solve these systems of equations using

i) Gaussian elimination and Gauss-Jordan Elimination methods (10 marks)

ii) Cramers Rule (10 marks)

QUESTION THREE (20 MARKS)

a) If **u** and **a** are vectors in 2 or 3 space and if $a \neq 0$. Proof that

i) $proj_a u = \frac{u.a}{\|a\|^2}.a$ (Vector component of u along a) (4 marks)

ii) $u - proj_a u = u - \frac{u.a}{\|a\|^2}.a$ (Vector component of u orthogonal to a)

(4 marks)

b) Let u = (2, -1, 3) and **a** = (4, -1, 2) .
Find

i) The vector component of **u** along **a** (3 marks)

ii) The vector component of **u** orthogonal to **a** (3 marks)

c) Use cross product to find the sine of the angle between the vectors u = (2, 3, -6) and v = (2, 3, 6) (6 marks)

QUESTION FOUR (20 MARKS)

a) Obtain the inverse of the following matrix using row reduction method

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{pmatrix}$$ (10 marks)

b) Obtain the inverse of the following matrix using determinant method

$$A = \begin{pmatrix} 3 & 2 & -1 \\ 1 & 6 & 3 \\ 2 & -4 & 0 \end{pmatrix}$$ (10 marks)

QUESTION FIVE (20 MARKS)

a) Let $u = (u_1, u_2, u_3)$ and $v = (v_1, v_2, v_3)$ be two nonzero vectors. If θ is the angle between u and v. Show that $u.v = u_1v_1 + u_2v_2 + u_3v_3$ (6 marks)

b) Let $u = (u_1, u_2, u_3,.......u_n)$ and $v = (v_1, v_2, v_3,......v_n)$ are vectors in R^n. Show that $|u.v| \leq \|u\| \|v\|$ (4 marks)

c) Verify that the Cauchy – Schwarz inequality holds for

i) u = (3, 2) and v = (4,1) (3 marks)

ii) U = (-4, 2, 1) and v = (8, -4, -4) (3 marks)

d) Given u = (-3, 2, 1, 0), v = (4, 7, -3, 2) and w = (5, -2, 8, 1). Find

i) 2u + 7v (2 marks)

ii) (6v – w) - (4u +v) (2 marks)