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KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 109: LINEAR ALGEBRA FOR COMPUTER SCIENCE

DATE: Tuesday, 28th August 2018 **TIME:** 11.00 a.m. - 1.00 p.m.

INSTRUCTIONS:

Attempt **QUESTION ONE (COMPULSORY)** and **ANY OTHER TWO**

60

QUESTION ONE (30 MARKS)

a) Determine whether the set A = {(2,0,3), (1,2,0), (3,2,3)} is linearly dependent or independent. (4 marks)

b) Let $A = \begin{pmatrix} 2 & 4 & -1 \\ 1 & 3 & 4 \\ 6 & 2 & 1 \end{pmatrix}$. Determine (2 Marks)

i. $|A|$ (2 Marks)

ii. Rank of **A** (2 Marks)

c) Find the inverse of the matrix $B = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$

d) Solve the following equation (4 mar

$3a - 3b + 2c = 9$

$5a + b - 2c = 1$

$a + b + c = 6$

$7a - 2b = 10$

$4a - 3c = -5$

$4a = 3c - 5$

$a = \frac{3c-5}{4}$

a) Let $\breve{u} = (2, 4, -2)$, $\breve{v} = (-1, 4, 6)$ and $\breve{k} = (2, -2, 4)$. Find

i. $\breve{u} \cdot (\breve{v} \times \breve{k})$ Volum. (3 M

ii. Angle between $\breve{v}$ and $\breve{k}$. $\frac{\bar{U} \cdot \bar{V}}{|\bar{U}||\bar{V}|}$ $\cos^{-1} = \theta$ (3 M

$7\left(\frac{3c-5}{4}\right) - 2b = 10$

$6c - 10 - 2b = 10$

$6c - 2b = 20$

$6c = 20 + 2b$

$c = \frac{20 + 2b}{6}$

e) Find the area of the triangle determined by $u = (1,-1,2)$ and $v = (0,3,1)$ (3

f) Given that $F: \mathbb{R}^3 \to \mathbb{R}^2$ defined by $f(x,y,z) = (x + y + 2z, x - y)$. Determine if f a linear function. (

3

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g) Determine whether the vector $(3,3,3)$ is a linear combination of the vectors $w = (1,-2,2)$ and $v = (0,3,-1)$ (4 marks)

QUESTION TWO (20 MARKS)

a) Given that $B = \{(x, y) \in \mathbb{R}^2 \mid x = 2y\}$, determine whether B is a subspace of $\mathbb{R}^2$ (5 marks)

b) Show that the set of vectors $\bar{a} = j - 2k$, $\bar{a} = i - j + k$ and $\bar{c} = i + 2j + k$ is linearly independent (8 marks)

c) Determine whether the vector $(3,3,3)$ is a linear combination of the vectors $w = (1,-2,2)$ and $v = (0,3,-1)$. (7 marks)

QUESTION THREE (20 MARKS)

a) Determine whether all the vectors of the form $(a, a, 0)$ are subspaces of $\mathbb{R}^3$ (4 marks)

b) Reduce the following matrix in row echelon form $\begin{pmatrix} 1 & 2 & 3 & 2 & 4 \\ -1 & 5 & 8 & 3 & 2 \\ 2 & 7 & 3 & 0 & 1 \\ 3 & 3 & 9 & -2 & 5 \\ 6 & 0 & 2 & 6 & 7 \end{pmatrix}$ (6 marks)

c) Given that $F: \mathbb{R}^3 \to \mathbb{R}^2$ defined by $f(x,y,z) = (x + y + 2z, x - y)$. Determine

i. Is f a linear function. (4 mark

ii. Nullity of f (2 mar

iii. Rank of f (2 ma

QUESTION FOUR (20 MARKS)

a) If **u** and **v** are vectors in R^3 show that **u** x **v** is orthogonal to either **u** or **v** (3

b) Let $u = (-6,4,2)$ and $v = (3,1,5)$

i. Find a vector that is perpendicular to both u and v (3 marks)

ii. Determine magnitude of u (2 marks)

iii. Angle between u and v (3 marks)

c) Find the equation of a plane that passes through (1, 2, 3), (2, 5, 7) and (4, 6, 5) (5 marks)

d) Find the equation for the line passing through $P(3,-1,2)$ and parallel to the vector (2,1,3) (4marks)

QUESTION FIVE 20 (MARKS)

a) Evaluate $\begin{vmatrix} 2 & -4 & 3 \\ 2 & -8 & 5 \\ 1 & 1 & 4 \end{vmatrix}$ (4 marks)

b) Find the distance of the point $A\,(25,5,7)$ from the plane $12x+4y+3z=3$ (6 marks)

c) Find the Eigen values of the matrix $A = \begin{pmatrix} 0 & 1 \\ -2 & -3 \end{pmatrix}$ (3 Marks)

d) Show that the set $\{(3,8,7,-3),(1,5,3,-1),(2,-1,2,6),(1,4,0,3)\}$ is a linearly independent set. (7 marks)

2 -1 2 2 -1
4 4 6 4 4
2 -2 4 2 -2

2 4 2 2 4
-1 4 6 -1 4
2 -2 4 2 -2

84 − (

$(2\times4\times4)+(-1\times6\times2)+(2\times4\times-2)-[(2\times4\times2)+(2\times6\times-2)+(-1\times$

$(32-12-16]-[16-24-16)$

$4 - .28$

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KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2015/2016
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 109: LINEAR ALGEBRA FOR COMPUTER SCIENCE

DATE: FRIDAY 15TH APRIL 2016 **TIME: 11.00 A.M. - 1.00 P.M.**

INSTRUCTIONS: Attempt **QUESTION ONE (COMPULSORY)** and **ANY OTHER TWO**

QUESTION ONE (30 MARKS)

a) Determine whether the set A = {(2,0,3), (1,2,0), (3,2,3) is linearly dependent or independent. (4 marks)

b) Given that $2t\hat{\imath} + 4h\hat{\jmath} + 6\hat{k} = -10\hat{\imath} + 8\hat{\jmath} + 4c\hat{k}$ find t, h and c. (3 marks)

c) Let $a = (1,-2,4)$ and $b = (-3.\ 5,-1)$.

Find

i. $a \times b$ (3 marks

ii. $3a.2b$ (2 mark

d) Solve the following equation

$$3a - 3b + 2c = 9$$
$$5a + b - 2c = 1$$
$$a + b + c = 6$$
(5 marl

e) Consider the vectors $a = (4,-5,7)$ and $b = (3,5,-7)$. Find $u.v$ and determine the angle bet

u and v. (5 ma

f) Find the area of the triangle determined by $u = (1,-1,2)$ and $v = (0,3,1)$ (4 ma

g) Determine whether the vector $(3,3,3)$ is a linear combination of the vectors $w = (1,-2,2$

$v = (0,3,-1)$ (4 m

INVOLVEMENT IN ANY EXAMINATION IRREGULARITY SHALL LEAD TO DISCONTINUATION

QUESTION TWO (20 MARKS)

a) Given that $B = \{(x, y) \in \mathbb{R}^2 | \ x = 2y\}$, determine whether B is a subspace of $\mathbb{R}^2$ (5 marks)

b) Show that the set $\{(3,8,7,-3), (1,5,3,-1), (2,-1,2,6), (1,4,0,3)\}$ is a linearly independent set. (8 marks)

c) Determine whether the vector $(3,3,3)$ is a linear combination of the vectors $w = (1,-2,2)$ and $v = (0,3,-1)$ (7 marks)

QUESTION THREE (20 MARKS)

a) Let $u = (-6,4,2)$ and $v = (3,1,5)$

i. Find a vector that is perpendicular to both u and v (3 marks)

ii. Determine magnitude of u (2 marks)

iii. Angle between u and v (3 marks)

b) Find the equation of a plane that passes through (1, 2, 3), (2, 5, 7) and (4, 6, 5) (7 marks)

c) Find the equation for the line passing through $P(3,-1,2)$ and parallel to the vector $(2,1,3)$ (5 marks)

QUESTION FOUR (20 MARKS)

a) Determine whether all the vectors of the form $(a, a, 0)$ are subspaces of $\mathbb{R}^3$ (4 marks)

b) Given that $F: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ defined by $f(x, y, z) = (x + y + 2z, x - y)$. Determine

i. Is f a linear function. (6 marks)

ii. Kernel of f (3 marks)

iii. Image of f (3 marks

iv. Nullity of f (2 marks

v. Rank of f (2 mark

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