From the SelectedWorks of OLAYIWOLA Morufu Oyedunsi

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PAST QUESTIONS

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OSUN STATE UNIVERSITY, OSOGBO, NIGERIA

COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MATHEMATICAL AND PHYSICAL SCIENCES

2009/2010 Session B.Sc,B.Sc (Ed.) Degree Harmattan Semester Examinations

Course Code: MTH 203 **Course Title**: Linear Algebra I **No. of Units**: 02

Instruction: Answer any Four Questions in All **Time Allowed**: 120 Mins.

QUESTION ONE

(a) Define Vector Space.

(b) Define Linear Dependence and Independence.

(c) Show that in the Vector Space R^n , the following set of vectors $\{e_i = (0,...0,1,0,...,0), i = 1...n\}$ with the ith entry is a basis for R^n

QUESTION TWO

(a) What is a Subspace?

(b) Let U and W be subspaces of a finite dimensional vector space V over a field F . Prove that $U+W$ is a subspace of V , where $U+W = \{U+W \,/\, u \in U \,,\, w \in W\}$

(c) For which real number λ are the following vectors linearly independent in R^3 ?

$$X1 = \begin{bmatrix} \lambda \\ -1 \\ -1 \end{bmatrix}, X2 = \begin{bmatrix} -1 \\ \lambda \\ -1 \end{bmatrix}, X3 = \begin{bmatrix} -1 \\ -1 \\ \lambda \end{bmatrix}$$

QUESTION THREE

(a) Define the following:

(i)Linear Transformation. (ii) Monomorphism.

(iii) Epimorphism. (iv) Isomorphism

(b) Let $T : V_n(F) \to V_m(F)$ linear transformation. Prove that the Kernel of T is a subspace of $V_m(F)$ and the Image of T is a subspace of $V_m(F)$

QUESTION FOUR

(a) Let A be a non-singular square matrix of order n over a field F. If A^* denotes the adjoint of A, prove that:

(i) $A \,.\, A^* = A^* \,.\, A = |A|\, I$ (ii) $A^{-1} = \dfrac{1}{|A|} A^*$

(b). Find, by means of elementary operations, the inverse of the following matrix:

$$A = \begin{pmatrix} 4 & 8 & -1 \\ 5 & -1 & 4 \\ 6 & 8 & 2 \end{pmatrix}.$$

QUESTION FIVE

(a) Find the condition for the system of equations

$$px + qy = u$$
$$rx + sy = v$$

have a unique solution.

(b) Given that $\begin{pmatrix} 5 & 2 \\ 2 & 4 \end{pmatrix}\begin{pmatrix} x \\ x^2 \end{pmatrix} = \begin{pmatrix} 3 \\ k \end{pmatrix}$. Find the two possible values of k.

QUESTION SIX

(a) Let U be the subspace of R^5 generated by $\{(1, -1, -1, -2, 0), (1, -2, -2, 0, -3), (1, -1, -2, -2, 1)\}$ and W the subspace generated by $\{(1, -2, -3, 0, -2), (1, -1, -3, 2, -4), (1, -1, -2, 2, -5)\}$. Find a basis and dimension for

(i) $U + W$ (ii) $U \cap W$