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**University Examinations 2016/2017**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE.

**SMA 2306: LINEAR ALGEBRA II**

**DATE: DECEMBER, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: -** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Determine whether T defined as below is a linear mapping:
2. defined by  (3 marks)
3. defined by  (3 marks)
4. Given that is a linear mapping defined by , compute the matrix of T in the basis  (4 marks)
5. Find the value of for which the determinant of A is -56, given  (5 marks)
6. Verify the Cayley-Hamilton theorem using the matrix (3 marks)
7. Find the characteristic polynomial and the eigen values of B, given that  (6 marks)
8. Let . Find an invertible matrix P and a diagonal matrix D such that  (6 marks)

**QUESTION TWO (20 MARKS)**

Consider the following basis of and

1. For  find
2.  (3 marks)
3.  (5 marks)
4. Find the transition matrix P from  to  and Q from  to  (6 marks)
5. Verify that  (2 marks)
6. Show that , for any vector . (4 marks)

**QUESTION THREE (20 MARKS)**

1. Given that , find all the eigen values and a basis for each eigen space of A. (10 marks)
2. Find all the eigen values and a basis for each eigen space of defined by  (10 marks)

**QUESTION FOUR (20 MARKS)**

1. Evaluate the determinant of the matrix (8 marks)
2. Find the value of x for which = (10 marks)
3. Show that 0 is an eigen value of T if and only if T is singular. (2 marks)

**QUESTION FIVE (20 MARKS)**

1. Given that T is a linear mapping defined by and find and in particular find (8 marks)
2. Given that  and is a basis of . Find the coordinate vector of V relative to the basis (5 marks)
3. Let V be the vector space of polynomial of degree , ie . The basis of V is given by the polynomials  and . Given that , find , coordinate vector of v relative to the basis  (7 marks)