

Math 244: Linear Algebra for Computer Science students 16 -2-1433 (Tuesday)

Final Exam Duration: 3 Hours

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| **Student,s Name** | **Student,s ID** | **Group No.** | **Lecturer,s Name** |
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| **Question No.** | **I** | **II** | **III** | **IV** | **V** | **VI** | **Bonus** | **Total** |
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Question One (11 Marks)

Determine whether the following is true or false with reasons

1. The operator defined by is linear (2 Marks)

a) true b) false

The reason

2. The dilation linear operator with factor in is one – to – one (2 Marks )

a) true b) false

The reason

3. (2 Marks )

a) true b) false

The reason

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4. If a set with two or more vectors is linearly dependent then at least one of the vectors

in is expressible as a linear combination of the other vectors in ( 3 Marks )

a) true b) false

The reason

5. span ( 2 Marks)

a) true b) false

The reason

Question Two (10 Marks)

Choose the correct answer

1. Using the matrix multiplication, the image of the vector if it is rotated

about the axis is: a. b. c. d. None.

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2. the standard matrix for the composition of liner operations on , where

is a reflection about the plane and is the orthogonal projection on the plane is

a. c. d. None

3. For 

a. b.

4. If and is an eigenvalue of then the homogeneous system has

a. The trivial solution. b. Nontrivial solution. c. is the solution of the system. d. None

5. The eigenvalues of , where

*c.*

6. The coordinate vector, of relative to the basis is

7. If , then

c.

8. If and are orthogonal vectors in a vector space , and , then

c.

9. If , then equals

c.

­­­­­­­­­­­­

10. If then is

c.

Question Three ( 10 Marks [ a.(3+2+3=8) , b.(2) ])

a. Let

i. Find the characteristic equation of

ii. Find the eigenvalues of

iii. Find bases for the eigenspaces of

b. If is an eigenvector corresponding to the eigenvalue for

Find a and b.

Question Four ( 7 Marks [ 2 , 3, 2] )

a. Show that the linear operator defined by the equations

is one-to-one ; and find

b. Use row reduction to evaluate where,



Question Five ( 5 Mark ( 2, 3, ))

a. Find all values of c for which is a noninvertible (singular) matrix.

b. Find all the possible values of as varies, where .

Question Six ( 7 Mark ( 2 , 3, 2))

a. Show that , under the addition operation defined by and the standard scalar multiplication; is not a vector space.

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c. Show that

­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­­Bonus Question ( 5 Marks [ 2.5 , 2.5])

a. If is a symmetric matrix with . Find

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b. Let and let be an operator defined by

. Show that is a linear operator

Good Luck