UAEU College of Science كلية العلوم
Department of Mathematical Sciences

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Dr. Nafaa Chbili

MATH 2220, Linear Algebra for Eng., Fall 2022

Test 3

Date: 23/11/2022, Time: 45mn

Student Name: ____

Student ID: ____

Attendance Number: ___________________________________

Question	1-2	3-4	Grade
Course Learning Outcome	3	1	
Marks	$\frac{\dots}{9}$	$\frac{\dots}{6}$	$\frac{\dots}{15}$

- Show all the steps of your solution for each question.
- Use only Blue or Black pen, neither pencil nor colored.
- Graphics and Programming calculators are not allowed.

Question 1. [**4 marks**] Given the matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 2 \end{bmatrix}$.

(a) Determine the eigenvalues of A.

(b) Determine a basis and the dimension of the eigenspace corresponding to the eigenvalue $\lambda = 2$.

(c) Determine whether A is diagonalizable. Justify your answer.

Question 2. [**5 marks**] Given the matrix $A = \begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$.

(a) Find a matrix P that digonalizes A.

(b) Use your answer in question **(a)** to compute A^{10}.

Question 3. [**2 marks**] Given $A = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 2 & 2 & 1 & 3 \\ 3 & 3 & 2 & 5 \end{bmatrix}$.

(a) Determine a basis for the row space of A.

(b) Find the rank of A.

Question 4. [**4 marks**] For each of the questions below, encircle the correct answer.

1. Given $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$. Then $v = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}$ is an eigenvector of A corresponding to the eigenvalue:

(A) 2 **(B)** 3 **(C)** -1 **(D)** 1 **(E)** None of the above

2. Let A and B be two similar matrices. Which of the following is not correct?

(A) Nullity(A)=Nullity(B).

(B) Rank(A)=Rank(B).

(C) det(A)=det(B).

(D) A and B have the same eigenspaces.

(E) A and B have the same characteristic polynomial.

3. Let A be a (4×7)-matrix whose rank is 3, then the nullity of A^T is:

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** None of the above

4. Given $A = \begin{bmatrix} 1 & 0 & 1 & 2 & 1 \\ 0 & 1 & 0 & 1 & 2 \\ 0 & 2 & 1 & 4 & 5 \end{bmatrix}$. Then nullity(A) is

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** None of the above