**Department of Mathematics**

**College of Sciences**

**King Saud University**

**Math 246**

**Final exam**

**First semester, 1435-1436H**

**Time: 3 Hrs**

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| **Name:** |
| **Student No. #:** |

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| **Question number** | I  | II | III | IV | V | VI |
| **Answer** |  |  |  |  |  |  |

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| **Question number** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **Answer** |  |  |  |  |  |  |  |

**I.** **Choose the correct answer**

1. If for some matrix A , the characteristic polynomial is p(λ )=(λ - 3)(λ - 2) 2, then

 the size of A is**:**

a) 3x3 b) 7x7 c) 6x6 d) None of the previous.

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1. If  and , then **u.v** is

a) 1 b) 3 c) -6 d) None of the previous.

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3) If B is 7x3 matrix, then its rank is at most

a) 3 b) 7 c) 4 d) None of the previous.

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 4) If A =$ [a\_{ij}]\_{n×n}$ such that det (A) = 2, and det (5A) = 150, then the size of A is:

a**)** 3x3 b) 4x4 c) 5x5 d) None of the previous.

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5) If λ=3 is an eigenvalue for A , then an eigenvalue of (A) 3 is

a) 1/3 b) 27 c) 1/27 d) None of the previous.

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6) The nullity of the matrix A= is :

a) 2 b) 3 c) 0 d) None of the previous.

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 7) In M22 any 4 vectors

a)are linearly dependent. b) are linearly independent. c) span M22. d) None of the previous.

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**II.**Let 

(a) Prove that W is a subspace of M33 .

(b) Find a basis of W.

**III**- (a) Let



1. Find the Eigen values of A.
2. Find the Eigen space that corresponds to each of the Eigen values.
3. Prove that A is diagonalizable, find P such that P-1AP is diagonal.
4. Find P-1AP.

**IV**- Let *A,B* be nxn matrices, define



1. Prove that is an inner product on .
2. Find if A=3I.

**V**- Let R3 have the Euclidean inner product. Use Gram Shmidt process to transform the basis into an orthonormal basis, where .

**VI**- If 

 a) Prove that T is linear.

 b) Find Ker(T)

 c) Find a matrix representation of T.