**中山大学本科生期末考试**

**考试科目：《 高 等 代 数 》（A卷）**

学年学期：**2017**学年第**1**学期 姓 名：

学 院/系：数据科学与计算机学院 学 号：

考试方式：闭卷 年级专业：

考试时长：120分钟 班 别：

任课老师：

警示 《中山大学授予学士学位工作细则》第八条：“考试作弊者，不授予学士学位。”

------------以下为试题区域，共**三**道大题，总分100分,考生请在答题纸上作答------------

1. **客观题（共 5 小题，每小题 3 分，共 15 分）**
2. (3%) Each eigenvalue of is also an eigenvalue of . (True or False，justify)
3. (3%) If is a subspace of , then and have no vectors in common. (True or False，justify)
4. (3%) If ,,,, then the maximal linearly independent set is(A) **,** (B) **,** (C) **,** (D) **,**
5. (3%) The general solution of is , then is  
   (A) (B) (C) (D)
6. (3%) If is a matrix, ,are solutions of , and **≠,** then the determinant of is  
   (A) 0 (B) 1 (C) (D) the determinant of depends on whether is.
7. **计算题（共 6 小题，共 65 分）**
8. Let , ,  
   (a) (5%) prove that form a basis of .  
   (b) (5%) compute the coordinates of relative to this basis .
9. (10%) Compute the determinant of the following matrix:
10. Let ,   
    (a) (5%) compute the eigenvalues of the given matrix.  
    (b) (5%) compute the eigenvectors of the eigenvalues in (a).
11. Let, (a) (5%) diagonalize . (b) (5%) compute .
12. Given the Vandermonde determinant:   
    (a) (5%) when n = 2, compute *D*.  
    (b) (5%) determine the general form of the determinant.
13. Let ,  
    (a) (5%) prove columns of are linearly independent.  
    (b) (5%) find an orthogonal basis for *ColA*.  
    (c) (5%) find a QR factorization of .
14. **证明题（共 3 小题，共 20 分）**

1.5CM

1. (5%) If are linearly independent, prove that are linearly independent.
2. (5%) Let is symmetric matrix, , are two subspaces of , and , . Please prove that is the orthogonal complement of in .
3. Let are matrics，please prove:  
   (a) (5%) If and is invertible, then .  
   (b) (5%) If is invertible, then .