软件学院 **2009** 级软件工程专业(2009-1)

《线性代数》期中试题试卷(A)

(考试形式：闭卷　　考试时间：100 分钟)

警 示

《中山大学授予学士学位工作细则》第六条

考 试 作 弊 不 授 予 学 士 学 位

方向：____________　　姓名：___________　　学号：___________成绩：_____________

注意：答案一定要写在答卷中，写在本试题卷中不给分。答题时注明各题题号，并在答题纸上写上姓名和学号。本试卷要和答卷一起交回。

一、填空题（每小题 4 分，共 16 分）

1. Let $A=\begin{bmatrix}-1 & X\\ 2y & -3\end{bmatrix}$ and $B=\begin{bmatrix}a & -4\\ 4 & a-b\end{bmatrix}$ if A = B, then a =________, b =_______, x =_______, y =_______。

2. Find the inverses of matrices $\begin{bmatrix}1 & 0 & -2\\ -3 & 1 & 4\\ 2 & -3 & 4\end{bmatrix}$.

3. Find, if possible, an LU factorization of each of the following matrices:

$$\begin{bmatrix}1 & 3 & 8\\ 2 & 5 & 21\\ 1 & 7 & -5\end{bmatrix}$$

4. Let $\alpha_1=\begin{bmatrix}1\\ -1\\ 4\end{bmatrix},\alpha_2=\begin{bmatrix}3\\ -5\\ 7\end{bmatrix},\alpha_3=\begin{bmatrix}-1\\ 5\\ \lambda\end{bmatrix}$, when λ = 　　　,$\{\alpha_1, \alpha_2, \alpha_3\}$ is linearly dependent set。

二、判断题（每小题 3 分，共 24 分）

1. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 0 & -0 & 1 \end{bmatrix}$ is elementary.

2. If A and B are invertible matrices, so is A + B.

3. The function T: R3 $\rightarrow$ R4 defined by $T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} x-y \\ y-z \\ z-x+2 \\ x+y+z \end{bmatrix}$ is a linear transformation

4. if $T: R^2 \rightarrow R^2$ is a linear transformation such that $T(\begin{bmatrix} -3 \\ 1 \end{bmatrix}) = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$, then T is not one to one

5. If a matrix A has row echelon from u, the pivot columns of A are the pivot columns of u

6. If a 4*4 matrix A has row echelon form $U = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 5 & -1 \\ 0 & 0 & 1 & 7 \\ 0 & 0 & 0 & 0 \end{bmatrix}$, the system Ax = 0 has only the trivial solution.

7. If A and B are invertible matrices and XA= B, the X= A^{-1}B.

8. If x_0 is a solution to the system Ax = b with $b \neq 0$, then $2x_0$ is also a solution.

三、计算题（40 分）

1. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \\ -6 & -7 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ 6 & 2 \\ -8 & 2 \end{bmatrix}$ solve the equation 2A + 4X=3B.

2. Let $A = \begin{bmatrix} 1 & -7 & 1 \\ 2 & -9 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 3 \\ 0 & 1 \\ 2 & 4 \end{bmatrix}$

   (a). Compute AB and BA

   (b). Is A invertible? Explain.

3. .Let $A=\begin{bmatrix}1&0&1&1\\2&1&0&1\\1&2&1&0\end{bmatrix}$, $X=\begin{bmatrix}1\\2\\1\\1\end{bmatrix}$

(a). Find Ax

(b). Find x^TA^T by two different methods

4. Let $V_1=\begin{bmatrix}2\\0\\2\end{bmatrix}$, $V_2=\begin{bmatrix}1\\1\\1\end{bmatrix}$, $V_3=\begin{bmatrix}-1\\1\\-1\end{bmatrix}$, and $V_4=\begin{bmatrix}0\\2\\0\end{bmatrix}$

Determine whether every vector in R3 is a Linear combination of the given vectors.write the solution x_0 the following Linear systems in the form x=xp+xh where xp is a particular solution and xh is a solution of the corresponding homogeneous system

$$\begin{cases}x_1+5x_2+7x_3=-2\\ \qquad 9x_3=3\end{cases}$$

四、证明题（每题 10 分，20 分）

1. Suppose A and B are m*n matrices such that $Ae_i=Be_i$ for each $e_i\in \boldsymbol{R}^n$, prove that A = B
2. Show that if A is an invertible matrix, then so is A^T, and $(A^T)^{-1}=(A^{-1})^T$