

	FINALTERM EXAMINATION SPRING 2006 MTH501 - LINEAR ALGEBRA	Marks: 60 Time: 120min
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StudentID/LoginID: _____

Student Name: _____

Center Name/Code: _____

Exam Date: _____

Please read the following instructions carefully before attempting any of the questions:

1. Attempt all questions. Marks are written adjacent to each question.
2. Do not ask any questions about the contents of this examination from anyone.
 - a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.
 - b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.
3. Choose the best possible answer in each **Multiple Choice Question**.

****WARNING: Please note that Virtual University takes serious note of unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

For Teacher's use only											
Question Marks	1	2	3	4	5	6	7	8	9	10	Total

Question No: 1 (Marks: 2) - Please choose one

$$\begin{bmatrix} 2 & 7 \\ 7 & 2 \end{bmatrix}$$

The characteristics polynomial for the matrix $A=$ is

▶ $\lambda^2 - 4\lambda - 45$

▶ $\lambda^2 + 4\lambda - 45$

▶ $\lambda^2 + 4\lambda + 45$

▶ $\lambda^2 - 4\lambda + 45$

Question No: 2 (Marks: 2) - Please choose one

Let $A = P A^4 P^{-1}$ then what will be A^4 where $A = \begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix}$, $D = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$

▶ $\begin{bmatrix} 226 & -525 \\ 90 & -209 \end{bmatrix}$

▶ $\begin{bmatrix} -525 & -226 \\ 90 & -209 \end{bmatrix}$

▶ $\begin{bmatrix} 266 & -525 \\ -209 & 90 \end{bmatrix}$

▶ None of the other

Question No: 3 (Marks: 2) - Please choose one

The origin of the dynamical system $x_{k+1} = A x_k$ for the matrix $A = \begin{bmatrix} .8 & .3 \\ -.4 & 1.5 \end{bmatrix}$ is

▶ Attractor

▶ Repellor

▶ Saddle point

▶ None of them

Question No: 4 (Marks: 2) - Please choose one

The distance between the vectors $u=(7,1)$ and $v=(3,2)$ is

- ▶ $\sqrt{-17}$
- ▶ $\sqrt{17}$
- ▶ $\sqrt{7}$
- ▶ $\sqrt{-7}$

Question No: 5 (Marks: 2) - Please choose one

$$\begin{bmatrix} 3 \\ -2 \\ 1 \\ 3 \end{bmatrix}, \begin{bmatrix} -1 \\ 3 \\ -3 \\ 4 \end{bmatrix}, \begin{bmatrix} 3 \\ 8 \\ 7 \\ 0 \end{bmatrix}$$

The vectors , , are

- ▶ Parallel
- ▶ Orthogonal
- ▶ Not Orthogonal
- ▶ Not parallel

Question No: 6 (Marks: 10)

Describe the solution of the following system in parametric vector form

$$x_1 + 3x_2 - 5x_3 = 4$$

$$x_1 + 4x_2 - 8x_3 = 7$$

$$-3x_1 - 7x_2 + 9x_3 = -6$$

Note : In order to get full marks do all necessary steps

Question No: 7 (Marks: 10)

$$\begin{bmatrix} -1 \\ -5 \\ 10 \end{bmatrix} \quad \begin{bmatrix} 5 \\ -2 \\ 1 \end{bmatrix}$$

Find the distance of y in R^n to a subspace $W = \text{Span}\{u_1, u_2\}$ where $y = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$, $u_1 = \begin{bmatrix} -1 \\ -5 \\ 10 \end{bmatrix}$, $u_2 = \begin{bmatrix} 5 \\ -2 \\ 1 \end{bmatrix}$.

$$\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

$$u_2 =$$

Note : In order to get full marks do all necessary steps

Question No: 8 (Marks: 10)

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

Find QR-Factorization of $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$. It is given that the column of A are the vectors x_1, x_2, x_3 and orthogonal basis for $\text{col}A = \text{Span}\{x_1, x_2, x_3\}$ are given by

$$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} \quad \begin{bmatrix} -3 \\ 1 \\ 1 \\ 1 \end{bmatrix} \quad \begin{bmatrix} 0 \\ -2/3 \\ 1/3 \\ 1/3 \end{bmatrix}$$

$$v_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \quad v_2 = \begin{bmatrix} -3 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \quad v_3 = \begin{bmatrix} 0 \\ -2/3 \\ 1/3 \\ 1/3 \end{bmatrix} \quad \text{Also check that } QR=A$$

Note : In order to get full marks do all necessary steps

Question No: 9 (Marks: 10)

$$\begin{bmatrix} -1 & 2 \\ 2 & -3 \\ -1 & 3 \end{bmatrix} \quad \begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}$$

Find the least square solution of the equation $Ax=b$ where $A = \begin{bmatrix} -1 & 2 \\ 2 & -3 \\ -1 & 3 \end{bmatrix}$, $b = \begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}$

Note : In order to get full marks do all necessary steps

Question No: 10 (Marks: 10)

Daigonalize the matrix , if possible

$$\begin{bmatrix} 0 & 0 & -2 \\ 0 & -2 & 0 \\ -2 & 0 & 3 \end{bmatrix}$$

Note : In order to get full marks do all necessary steps

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