King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 260 Exam-II
Semester II, 2010- (092)

Name:			
ID:		**Serial no:**	

Section

1	2	3	4
7:00-7:50	**8:00-8:50**	**9:00-9:50**	**10:00-10:50**
Dr. Fairag	**Dr. Fairag**	**Dr. Laradji**	**Dr. Fairag**

Q	FORM: **A**	Points
1		**10**
2		**10**
3		**10**
4		**10**
5		**13**
6		**10**
7		**14**
8		**10**
9		**13**
Total		**100**

☺ **Say Bismillah & Good luck** ☺

(1) Use Cayley-Hamilton theorem to compute $A^4 - 3A^3$

where $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -1 \\ -2 & -3 & 1 \end{bmatrix}$. **(show all your work)**

(2) Find a basis for the column space of the matrix

$$A = \begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 2 & -6 & 9 & -1 & 8 & 2 \\ 2 & -6 & 9 & -1 & 9 & 7 \\ -1 & 3 & -4 & 2 & -5 & -4 \end{bmatrix}$$

(show all your work)

(3) Find the rank of the matrix

$$A = \begin{bmatrix} 1 & 1 & -2 & 0 & 0 \\ 1 & 2 & 3 & 6 & 7 \\ 2 & 1 & 3 & 6 & 5 \end{bmatrix}$$

(show all your work)

(4) Determine whether or not the matrix

$$A = \begin{bmatrix} -2 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & -2 \end{bmatrix}$$

is diagonalizable. **(show all your work)**

(5) The characteristic equation of the matrix $C = \begin{bmatrix} 3 & 1 & -2 \\ -1 & 0 & 5 \\ -1 & -1 & 4 \end{bmatrix}$ is $(2-x)^2(3-x)$.

Find the Jordan form of the matrix C. **(show all your work)**

(6) Given that the matrix $A = \begin{bmatrix} 5 & -4 & 4 \\ 12 & -11 & 12 \\ 4 & -4 & 5 \end{bmatrix}$ is diagonalizable and has eigenvalues $\lambda = -3,1,1$.

Find a diagonalizing matrix P and a diagonal matrix D such that $D = P^{-1}AP$.

(show all your work)

(7) True or False.

[a]	The order of the differential equation $\left(\frac{d^3y}{dx^3}\right)^5 + 3\frac{d^2y}{dx^2} - 9\left(\frac{d^4y}{dx^4}\right)^2 - y = 0$ is 5.	(T) (F)
[b]	The equation $\left(\frac{\partial u}{\partial x}\right)^2 + \frac{\partial u}{\partial y} = y\sin x$ is a partial differential equation.	(T) (F)
[c]	$y(x) = 0$ is a singular solution for the differential equation $y^{-1/2}\frac{dy}{dx} = x$.	(T) (F)
[d]	$y(x) = 0$ is a singular solution for $y' = xy^{1/2}$.	(T) (F)
[e]	Let A be 4×4 matrix. A has eigenvalues $\lambda = 2,2,5,7$, then Rank(A) $\neq 4$.	(T) (F)
[f]	$y(x) = x + \ln x$ is a particular solution of the differential equation $x^2y'' + xy' - y = \ln x$.	(T) (F)
[g]	Let A be 4×4 matrix with characteristic polynomial $p(\lambda) = \lambda(\lambda-2)^3$, then det(A) = 0.	(T) (F)

(8) Find the eigenvalues of

$$A = \begin{bmatrix} 0 & 2 & 1 \\ 3 & -1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$$ **. (show all your work)**

(9) Solve the separable differential equation

$2(y^2+2y)\dfrac{dy}{dx}=(3x^2-4)(y^2-1)(y+2)$. **(show all your work)**

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