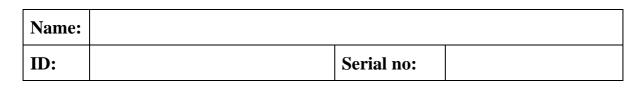
King Fahd University of Petroleum and Minerals Department of Mathematics and Statistics Math 260 Exam-II Semester II, 2010- (092)



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



(1) Use <u>Cayley-Hamilton</u> 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 $\left(\frac{d^3y}{dx^3}\right)^5 + 3\frac{d^2y}{dx^2} - 9\left(\frac{d^4y}{dx^4}\right)^2 - y = 0 \text{ is } 5.$	(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 $2(y^2 + 2y)\frac{dy}{dx} = (3x^2 - 4)(y^2 - 1)(y + 2)$ (show all your work)

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