King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 260 Final Exam
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	Your Points	Points
1		**20**
2		**20**
3		**20**
4		**20**
5		**20**
6		**20**
7		**20**
8		**10**
9		**10**
10		**10**
11		**10**
12		**10**
13		**10**
Total		**200**

☺ **Say Bismillah & Good luck** ☺

(1) Solve the system $X' = AX$

where $A = \begin{bmatrix} 6 & -1 \\ 5 & 2 \end{bmatrix}$. ($\lambda = 4 \pm i$ are eigenvalues of A)

(2) Solve the system $X' = AX$

where $A = \begin{bmatrix} -2 & 0 & 0 \\ 4 & 4 & 6 \\ -4 & -6 & -8 \end{bmatrix}$. (given that $\lambda = -2$ is an eigenvalue of multiplicity 3)

(3) Solve the initial value problem

$$y'''+4y'=0$$

$$y(0)=-1,\quad y'(0)=2,\quad y''(0)=4$$

(4) Find a particular solution of

$$y''+2y'-3y = 3-16xe^{x}$$

(5) Solve the differential equation

$$(x + 2\tan^{-1} y)dx + (\frac{2x + y}{1 + y^2})dy = 0$$

(6) Solve the differential equation

$$y''+(y')^2+1=0$$

(7) Verify that

$$X_1 = e^{-2t}\begin{bmatrix} 3 \\ -2 \\ 2 \end{bmatrix}, \quad X_2 = e^{t}\begin{bmatrix} 3 \\ -1 \\ 1 \end{bmatrix}, \quad X_3 = e^{3t}\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$$

are linearly independent solutions of the system $X' = AX$

where $A = \begin{bmatrix} -8 & -11 & -2 \\ 6 & 9 & 2 \\ -6 & -6 & 1 \end{bmatrix}$. Find a particular solution of the system satisfying the initial conditions $x_1(0) = 1,\ x_2(0) = 2,\ x_3(0) = 3$

(8) The rank of the matrix

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 \\ 3 & 3 & 3 & 3 \\ 4 & 4 & 4 & 4 \end{bmatrix}$$

equals

(a) 1
(b) 2
(c) 3
(d) 4

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(9) Compute the determinant

$$\begin{vmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{vmatrix} =$$

(e) -2
(f) -1
(g) 0
(h) 1
(i) 2

(10) The differential equation $3y^2y'+y^3=e^{-x}$ is

(a) Seprable (b) Linear (c) Bernoulli (e) None of the above

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(11) The matrix $A=\begin{bmatrix}2 & 1 & 1\\ 0 & 2 & 1\\ 0 & 0 & 2\end{bmatrix}$ is

(a) diagonalizable (b) not diagonalizable

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(12) The set of vectors $\left\{\begin{bmatrix}1\\6\\-13\end{bmatrix}, \begin{bmatrix}2e^{3t}\\3e^{3t}\\-2e^{3t}\end{bmatrix}, \begin{bmatrix}-e^{-4t}\\2e^{-4t}\\e^{-4t}\end{bmatrix}\right\}$ is

(a) linearly independent (b) linearly dependent

(13) Let A be an $n \times n$ matrix such that $A^3 = 0$. show that $\lambda = 0$ is an eigenvalue of A.