Prince Sultan University

Deanship of Educational Services

Department of Mathematics
and General Sciences

COURSE DETAILS:

DIFFERENTIAL EQUATIONS	MATH 225	MAJOR EXAM II
Semester:	Fall 2018-2019 --Term 181	
Date:	Saturday November 17, 2018	
Time Allowed:	80 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	93 95
Instructor's Name:	J. Alzabut

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Total
Questions	1	2,3	4.5	
Marks	8	14	18	40

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Q.1 (8 points) Consider the equation $x^2 y'' - 3xy' + 13y = 4 + 3x$

    a) Use the substitution $x = e^t$ to transform the Cauchy Euler equation to a differential equation with constant coefficients.

    b) Solve the new nonhomogeneous equation.

    c) Write the general solution as $y = y_c + y_p$.

Q.2 (6 points) Determine the singular points of the equation $x^2(1-x)y'' + (x-3)y' - 3xy = 0$. Classify each singular point as regular or irregular.

Q.3 (8 points) Use Laplace method to solve the equation $y'' + 5y' + 4y = 0$, $y(0) = 1$, $y'(0) = 0$: use partial fraction decomposition.

Q.4 (8 points) Find the Laplace of $f(t)$ if

a) $f(t) = \left(1 - e^t + 3e^{-3t}\right)\cos 5t$.

b) $f(t) = \cos 2t . u(t - \pi)$.

Q.5 (10 points) Find the Laplace inverse of $F(s)$ if

a) $F(s) = \dfrac{2}{s^2(s^2 + 4)}$: use convolution theorem.

b) $F(s) = \dfrac{1}{s^2 - 6s + 10}$.