Name _____

Prince of Songkla University

Faculty of Engineering

Midterm Test — Semester 1/2015

8 October 2015 — 9:00-12:00

215-613 Mathematical Methods in Engineering — Room A 200

Direction:

1. All types of calculators, document and books are permitted.
2. There are totally 4 problems. Solve all of them.

Total 60 points

Problem #	Full Score	Your mark
1	10	
2	10	
3	20	
4	20	
Total	**60**	

Perapong Tekasakul

Instructor

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215-613
Mathematical Methods in Engineering

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Total 60 points

1. (a) Under what situation, the engineering problem is described by an ordinary differential equation. (2 points)

(b) Give examples when the heat transfer problem are described by ordinary differential equation and partial differential equation. (2 points)

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(c) When you encounter a problem to solve an ordinary differential equation, explain how you decide which method you choose to solve it. (6 points)

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2. Solve the initial value problem. (10 points)

$$y'' - 6y' + 9y = e^{3x}$$
$$y(0) = 5$$
$$y'(0) = 2$$

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3. Solve the following problem. (20 points)

(a) $\left(1-x^2\right)y''-2xy'+12y=0$

$y(1)=2$

(b) $x^2y''+xy'+\left(x^2-1\right)y=0$

$y(0)=0$

$y'(0)=5$

Hint: $J_1'(x)=\frac{1}{2}\left[J_0(x)-J_2(x)\right]$, $J_0(0)=1, J_1(0)=0, J_2(0)=0$ and $Y_0(0)=\infty$.

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4. The mass-spring-damper system is subjected to an external force and motion of the mass is described by

$$2y'' + 3y' - 2y = u(t) + \delta(t-1)$$
$$y(0) = 0$$
$$y'(0) = 0$$

Determine the response, $y(t)$. (20 points)