Name _____

Prince of Songkla University

Faculty of Engineering

Midterm Test   Semester 1/2012

4 August 2012   9:00-12:00

215-613 Mathematical Methods in Engineering   Room S203

Direction:

1. All types of calculators, document and books are permitted.

2. There are totally 5 problems. Solve all of them.

Total 70 points

Problem #	Full Score	Your mark
1	10	
2	15	
3	10	
4	15	
5	20	
Total	**70**	

Perapong Tekasakul

Instructor

Name _____

215-613
Mathematical Methods in Engineering

Midterm Test
Semester 1/2011
Total 70 points

1. Describe if the following differential equations are *ordinary* or *partial*, *linear* or *non-linear*, *homogeneous* or *nonhomogeneous*, and give the *order* of the differential equations as well. (10 points)

(a) $x^5 \dfrac{d^3 y}{dx^3} + \left(\dfrac{dy}{dx} \right)^2 + 32y - 5 = 0$

(b) $\dfrac{d^3 u}{dy^3} - y^{1.5} \dfrac{d^2 u}{dy^2} = u$

(c) $\dfrac{dy}{dx} - \dfrac{1}{y} = y$

(d) $y^2 \dfrac{d^4 y}{dx^4} - 3 \dfrac{d^2 y}{dx^2} = y$

(e) $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} - 1 = 0$

#	Order	ODE or PDE	Linear or nonlinear	Homogeneous or nonhomogeneous
(a)				
(b)				
(c)				
(d)				
(e)				

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2. Solve the initial value problem. (15 points)

$$y'' - 2y' + y = 4e^x$$
$$y(0) = 4$$
$$y'(0) = 1$$

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3. What are solutions to the following ODE?

$$x^2 y'' + \frac{1}{4}\left(x + \frac{3}{4}\right) y = 0$$

Hint: Set $y = u\sqrt{x}, \quad \sqrt{x} = z$ (10 points)

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4. Solve the following problem. (15 points)

$$x^2 y'' - 0.2xy' + 0.36y = 0$$
$$y(1) = 1$$
$$y'(1) = 2$$

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

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

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