Prince of Songkla University
Faculty of Engineering

Final Test

7 October 2006

215-613 Mathematical Methods in Engineering

Semester 1/2548

13:30 – 16:30

Room R300

Name _____

Direction:
1. Open book exam.
2. There are total of 3 problems.

Problem	Full score	Your score
1	20	
2	15	
3	10	
Total	45	

Perapong Tekasakul

Instructor

Final Test
Semester 1/2549
Total 45 points

1. The 1-D heat conduction in a 1-m long iron rod can be described by

$$\frac{\partial T}{\partial t} = c^2 \frac{\partial^2 T}{\partial x^2}$$

where $c^2 = 0.5$ m^2/sec. The boundary conditions are

$$\left. \frac{\partial T}{\partial x} \right|_{x=0} = 0 \quad \frac{^\circ C}{m}$$

$$T(1,t) = 100\,^\circ C$$

and the initial temperature profile is $T(x,0) = 100x^2$.

   Draw the initial temperature profile and determine the temperature profile in the rod at any time t. (20 points)

2. The 1-D heat conduction in a semi-infinite bar has the following conditions:

$$\left. \frac{\partial T}{\partial x} \right|_{x=0} = 0 \quad \frac{^\circ C}{m}$$

$$T(x,0) = \begin{cases} 100\cos x & ^\circ C, \quad 0 < x \le \pi/2 \\ 0 & ^\circ C, \quad\quad x > \pi/2 \end{cases}$$

   Determine the temperature profile in the rod at any time t. Do as much as you can.
   (15 points)

3. Following is a system of four linear equations with only three unknowns. Does this system have a unique solution? If you think the solution exists, solve it by Gaussian Elimination. (10 points)

$$-w + x + 2y - 2z = 10$$
$$w - 2x - 2y + 3z = -6$$
$$-2w + 5x + y + 2z = -1$$
$$5w - 4x + 10y - 6z = 12$$