Prince of Songkla University
Faculty of Engineering

Final Test   Semester 1/2552

30 September 2009   9:00-12:00

215-613 Mathematical Methods in Engineering   Room: The Robot Head Room

Name _____ ID _____

Direction:

1. Open book exam. Everything is allowed.
2. There are total of 5 problems.

Problem	Full score	Your score
1	10	
2	10	
3	10	
4	20	
5	10	
Total	60	

Perapong Tekasakul

Instructor

Final Test
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Total 60 points

1. Plot the graphs and determine if the following functions are odd, even, or neither odd nor even? (10 points)

    (a) $y = \left(x^2 + 1\right)^{-3}$

    (b) $y = \left|e^{-2x}\right|$

    (c) $y = \cos x^3$

    (d) $y = x - 1$

    (e) $y = \left(2x - 1\right)^3$

2. Find the Fourier series of (10 points)

$$f(x) = 2x \quad (-1 < x < 1), p = 2L = 2$$

3. Find the Fourier transform of (10 points)

$$f(x) = \begin{cases} e^x & \text{if} -a < x < a \\ 0 & \text{otherwise} \end{cases}$$

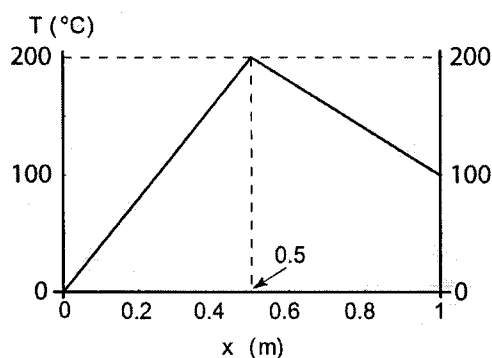4. The 1-D heat conduction in a 1-m long iron rod can be described by

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

    where $c^2 = 1$ m^2/sec. The boundary conditions are

$$T(x = 0, t) = 0\,^\circ\text{C}$$

$$T(x = 1, t) = 100\,^\circ\text{C}$$

    The initial temperature profile is shown in the following figure

    Write the initial condition in mathematical representation and determine the temperature profile in the rod. (20 points)

5. One end of a semi infinite string is fixed to the wall at $x = 0$. The boundary condition and initial conditions are

$$BC: \quad u(0,t) = 0$$

$$ICs: \quad u(x,0) = f(x)$$

$$\left. \frac{\partial u}{\partial t} \right|_{t=0} = 0$$

Convert the partial differential equation to an ordinary differential equation, and obtain general solution. Do not attempt to solve for constants. (10 points)