



# Signal Processing and Analysis

## **Homework 4**

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# Methods for 2nd-order PDE

A laterally insulated homogeneous bar with ends at  $x = 0$  and  $x = 1$  has initial temperature  $u(t = 0, x) = 0$ . Its left end is kept at 0, whereas the temperature at the right end varies sinusoidally according to

$$u(t, x = 1) = \sin \frac{25}{3} \pi t$$

Find the temperature  $u(t, x)$  in the bar using heat diffusion equation

$$\frac{\partial u(t, x)}{\partial t} = \frac{\partial^2 u(t, x)}{\partial x^2}$$

by the explicit method with  $h = 0.2$  and  $r = 0.5$  and Crank-Nicolson method for one period, that is,  $0 \leq t \leq 0.24$ .