



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

AN AUTONOMOUS INSTITUTION



Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Tutorial

One-D heat by implicit method(Crank Nicholson):

1. Using Crank-Nicholsons scheme, solve $u_{xx}=16u_t$, $0 < x < 1$, $t > 0$ given $u(x,0)=0$, $u(0,t)=0$, $u(1,t)=100t$ compute u for one step in t - direction taking $h=\frac{1}{4}$.
2. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t \geq 0$ given that $u(x,0)=20$, $u(0,t)=0$, $u(5,t)=100$. Compute u for the time-step with $h=1$ by Crank-Nicholson method.

One-D wave equation:

3. Solve $\frac{1}{4} \frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ with condition $u(0,t)=0=u(4,t)$, $u(x,0)=x(4-x)$ $u_t(x,0)=0$, taking $h=1$ up to $t=4$.
4. Solve using finite differences $16u_{xx}=u_{tt}$ with the step length $h=1$ and up to $t=1$ given that $u(0,t)=u(5,t)=0$, $u(x,0)=x^2(5-x)$, in $u_t(x,0)=0$