CFD Project#1

(Finite Difference Method)

Consider a large wall of thickness L whose initial temperature is given by $T(t, x) = c \sin \pi x/L$. If the faces of the wall continue to be held at $0°$, then a solution for the temperature at $t > 0$, $0 \leq x \leq L$ is:

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

$$T(t,x) = c \exp\left(\frac{-\alpha \pi^2 t}{L^2}\right) \sin\left(\frac{\pi x}{L}\right)$$

For this problem, let $c = 100°C$, $L = 1m$, $\alpha = 0.02 m^2/h$.

Solve the problem using two methods: **Explicit and Implicit schemes.**

Your report must have:

1-discretization details

2-Algorithm (flowchart) of the code

3-Mesh independency study (report mesh sizes)

4-Stability checks

5-Validation with analytical solution (for 10 hours period)

6-comparing explicit and implicit results (for 10 hours period)

Note: if you need further information, just make assumptions.