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Assignment Questions of (M.Sc Sem IV)

Paper Code - CC Math 401

1) 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.

2) Solve the boundary value problem $u_t = u_{xx}$ under the conditions $u(0, t) = u(1, t) = 0$ and $u(x, 0) = \sin \pi x$, $0 < x < 1$ using Schmidt method.

Take $h=0.2$ and $\alpha = 1/2$.

3) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$

subject to the initial conditions

$$u(x, y, 0) = \sin 2\pi x \sin 2\pi y \quad 0 \leq x, y \leq 1$$

and the conditions $u(x, y, t) = 0, t > 0$ on the boundaries, using ADE method

with $h = \frac{1}{3}$ and $\alpha = \frac{1}{8}$. (Calculate the results for one time level.)

④ Describe the method to solve the hyperbolic equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ by implicit scheme.

⑤ Find the solⁿ of the initial boundary value problem: $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$, $0 \leq x \leq 1$; Subject to the initial conditions $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$, $\left(\frac{\partial u}{\partial t}\right)(x, 0) = 0$, $0 \leq x \leq 1$

and the boundary conditions $u(0, t) = 0$, $u(1, t) = 0$, $t > 0$

by using in the (a) the explicit scheme

(b) the implicit scheme