NPTEL Online Certification

COMPUTATIONAL HYDRAULICS
Week 3 : Assignment-Solution
July 24-October 13, 2017

NOTE: Attempt **ALL** questions. Make suitable assumptions, wherever necessary.

1. Discretization error depends on

- Truncation error of governing equation and boundary conditions

2. Round-off error depends on

- Precision of computer

3. Numerical stability/ instability depends on

- Solution algorithm
- Discretization of Governing equation and boundary conditions

4. Amplification factor/ growth factor in von Neumann stability analysis depends on

- Amplitude of Fourier component

5. Error remains same in case of

- Neutrally stable scheme

6. Implicit scheme for IBVP problem is

- Unconditionally stable

7. Crank-Nicolson scheme

- Unconditionally stable

8. The discretized governing equation for IBVP with the following scheme $\Lambda_\phi \frac{\phi_{i,j}^{n+1}-\phi_{i,j}^{n-1}}{2\Delta t} = \Gamma_x \frac{\phi_{i+1,j}^{n}-2\phi_{i,j}^{n}+\phi_{i-1,j}^{n}}{\Delta x^2} + \Gamma_y \frac{\phi_{i,j+1}^{n}-2\phi_{i,j}^{n}+\phi_{i,j-1}^{n}}{\Delta y^2} + S_\phi\big|_{i,j}^{n}$ is

- Unconditionally unstable

9. The discretized governing equation for IBVP with the following scheme $\Lambda_\phi \frac{\phi_{i,j}^{n+1}-\phi_{i,j}^{n-1}}{2\Delta t} = \Gamma_x \frac{\phi_{i+1,j}^{n}-2\phi_{i,j}^{n}+\phi_{i-1,j}^{n}}{\Delta x^2} + \Gamma_y \frac{\phi_{i,j+1}^{n}-2\phi_{i,j}^{n}+\phi_{i,j-1}^{n}}{\Delta y^2} + S_\phi\big|_{i,j}^{n}$ has truncation error of

- $\mathcal{O}(\Delta x^2, \Delta y^2, \Delta t^2)$

10. Finite Volume Method is essentially minimization of

- weighted sub-domain error