NPTEL Online Certification

COMPUTATIONAL HYDRAULICS
Week 4 : Assignment
July 24-October 13, 2017

1. A system (m equations) is hyperbolic at a point (x, t) for conservation law, if

- Jacobian matrix of flux term (m numbers) with respect to variables has real eigenvalues
- Jacobian matrix of flux term (m numbers) with respect to variables has linearly independent eigenvectors

2. Total Variation Diminishing (TVD) scheme is

- monotonicity preserving method

3. Slope at P^{th} cell in numerical flux calculation with high resolution methods for Fromm method can be calculated as,

- $\sigma_P^n = \frac{\sigma_E^n - \sigma_W^n}{2\Delta x}$

4. Numerical flux function for Godunov method in case of one dimensional conservational law with flux term $\mathcal{F}_\phi = a\phi$ [where a = constant, $a^+ = \max(a,0)$, $a^- = \min(a,0)$] is

- $\bar{\mathcal{F}}_\phi(\phi_e(0)) = a^-\phi_E^n + a^+\phi_P^n$
- $\bar{\mathcal{F}}_\phi(\phi_w(0)) = a^-\phi_P^n + a^+\phi_W^n$

5. Numerical flux function for upwind method in case of one dimensional conservational law with flux term $\mathcal{F}_\phi = a\phi$ (where a = constant) is

- All of the above

6. Lax-Friedrichs scheme for one dimensional conservational law with flux term $\mathcal{F}_\phi = a\phi$ (where a = constant) is

- Conditionally stable
- Conditionally unstable

7. In Riemann problem, variable value

- is different on both sides of a face under consideration.

8. Partition of unity means

- Summation of all shape functions within support domain is equal to 1.

9. Polynomial basis of order 2 in one dimension contains

- $1\ x\ x^2$

10. In mesh-free method, node spacing (d_c) in two-dimension depends on

- Area of estimated support domain