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NPTEL

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Courses » Introduction to Finite Volume Methods II

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Unit 6 - week 5 - High resolution schemes + Temporal discritisation

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Course outline

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Week 1 - Linear solvers

Week 2 - Linear solvers + Convection term discretisation

Week 3 - Convection term discretisation

week 4 - Convection term discritisation + High resolution schemes

week 5 - High resolution schemes + Temporal discritisation

- High Resolution Schemes-IV
- High Resolution Schemes-V
- High Resolution Schemes-VI

Assignment 5

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2019-03-06, 23:59 IST.**

1) Which of these statements are true for **cross-stream diffusion** error? ***1 point***

- [ ] This type of error is observed only in 1D flow.
- [ ] This type of error is observed only in 2D or 3D flow.
- [ ] This type of error occurs when velocity field is aligned with the grid.
- [ ] This type of error occurs when velocity field is not aligned with the grid.

No, the answer is incorrect.
Score: 0

Accepted Answers:
This type of error is observed only in 2D or 3D flow.
This type of error occurs when velocity field is not aligned with the grid.

2) Which of these statements are true for **dispersion error**? ***1 point***

- [ ] This kind of error occurs when leading truncation error term in discretised scheme is of odd order.
- [ ] This kind of error occurs when leading truncation error term in discretised scheme is of even order.
- [ ] This causes smeared and highly diffused solution at sharp gradient in the flow.
- [ ] This causes overshoot/undershoot in the solution at sharp gradients in the flow.

No, the answer is incorrect.
Score: 0

Accepted Answers:
This kind of error occurs when leading truncation error term in discretised scheme is of odd order.
This causes overshoot/undershoot in the solution at sharp gradients in the flow.

3) The gradient form of the convection term discretisation using FROMM scheme is ***1 point***

$\phi_f = \phi_c + 2\nabla\phi_f . d_{cf}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\phi_f = \phi_c + \nabla\phi_c . d_{cf}$

4) Which of this is true for **Deferred Correction Approach**? ***1 point***

- This results in an equation for which the coefficient matrix is always diagonally dominant.
- This is very complex to implement compared to the upwind scheme.
- Convergence rate diminishes as the difference between the cell face values calculated with the upwind scheme and that calculated with the HO scheme becomes smaller.
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
This results in an equation for which the coefficient matrix is always diagonally dominant.

5) For improved convergence behavior of any **composite High Resolution (HR)** scheme ***1 point***

- It should avoid hard angles at the profile connection points.
- It should avoid hard angles at the horizontal profile.
- It should avoid hard angles at the vertical profile.
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

6) Which of this is true for **Total Variance Diminishing (TVD)** scheme? ***1 point***

$TV = \Sigma_i |\phi_{i+1} - \phi_i|$

- The TV does not increase with time.
- $TV(\phi^{t+\Delta t}) \leq TV(\phi^t)$
- This is monotonicity preserving scheme.
- All of the above.

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above.

7) TVD Limiter for QUICK scheme is given by ***1 point***

- $\psi(r_f) = \frac{1+r_f}{2}$
- $\psi(r_f) = \frac{1-r_f}{2}$
- $\psi(r_f) = \frac{3+r_f}{4}$

$\psi(r_f) = \frac{3-r_f}{4}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\psi(r_f) = \frac{3+r_f}{4}$

8) Which statement is true for second order TVD Limiters? ***1 point***

- $\psi(r_f) = 1$ for $r_f = 1$
- $\psi(r_f) = 2$ for $r_f = 1$
- $\psi(r_f) = 1$ for $r_f = 0$
- $\psi(r_f) = 2$ for $r_f = 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\psi(r_f) = 1$ *for* $r_f = 1$

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