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Courses » Introduction to Finite Volume Methods II

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Unit 4 - Week 3 - Convection term discretisation

Register for Certification exam

Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-02-20, 23:59 IST.

1) Which of these are true for Peclet number (Pe_L) based on length scale L ***1 point***

- This represents the ratio of the advective transport rate to its diffusive transport rate
- $Pe_L = \frac{\rho U L}{\Gamma}$ where ρ=density, U=advection speed and Γ=diffusion coefficient
- For pure convection problems, $Pe_L \to \infty$
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

2) For creeping flow, Peclet number (Pe_L) is ***1 point***

- Very small
- Very large
- Approximately 1
- Can not say

No, the answer is incorrect.
Score: 0

Accepted Answers:
Very small

3) For a 1-D convection-diffusion problem on a uniform grid, let's define cell Peclet number as $Pe = \frac{\rho u \delta x}{\Gamma}$. When does central discretization of advection flux becomes inconsistent, given continuity equation is satisfied ***1 point***

No, the answer is incorrect.
Score: 0

Accepted Answers:
Pe > 2

4) For a 1-D convection-diffusion problem on a uniform grid, let's define cell Peclet number as $Pe = \frac{\rho u \delta x}{\Gamma}$. When does upwind discretization of advection flux becomes inconsistent, given continuity equation is satisfied ***1 point***

- Pe > 2
- Pe > 1/2
- Always unbounded
- Always bounded

No, the answer is incorrect.
Score: 0

Accepted Answers:
Always bounded

5) What can be said about central difference scheme for discretization of advection flux ***1 point***

- This is first order accurate
- This is second order accurate
- This is conditionally bounded
- This is unconditionally bounded

No, the answer is incorrect.
Score: 0

Accepted Answers:
This is second order accurate
This is conditionally bounded

6) What can be said about upwind scheme for discretization of advection flux ***1 point***

- This is first order accurate
- This is second order accurate
- This is conditionally bounded
- This is unconditionally bounded

No, the answer is incorrect.
Score: 0

Accepted Answers:
This is first order accurate
This is unconditionally bounded

7) What can be said about downwind scheme for discretization of advection flux ***1 point***

- This is first order accurate
- This is second order accurate
- This is conditionally bounded
- This is unconditionally bounded

No, the answer is incorrect.
Score: 0

Accepted Answers:
This is first order accurate

8) For an unsteady convection-diffusion equation $\frac{\partial \rho\phi}{\partial t} = -\frac{\partial \rho u \phi}{\partial x} + \frac{\partial}{\partial x}(\Gamma \frac{\partial \phi}{\partial x}) + Q = RHS$. For numerical stability of the solution to the equation

1 point

- $\frac{\partial(RHS)}{\partial \phi_c} < 0$
- $\frac{\partial(RHS)}{\partial \phi_c} > 0$
- $\frac{\partial(RHS)}{\partial \phi_c} = 0$
- Always stable

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{\partial(RHS)}{\partial \phi_c} < 0$

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