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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

Course outline

How to access
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Week 1 - Linear
solvers

Week 2 - Linear
solvers +
Convection term
discretisation

Week 3 -
Convection term
discretisation

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- Quiz : Assinment 3

Assignment 3

The due date for submitting this assignment has passed.

As per our records you have not submitted this **Due on 2019-02-20, 23:59 IST.** assignment.

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

$Pe_L = \frac{\rho UL}{\Gamma}$ where ρ =density, U =advection speed and Γ =diffusion coefficient

For pure convection problems, $Pe_L \rightarrow \infty$

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 **1 point**

as $Pe = \frac{\rho u \delta x}{\Gamma}$. When does central discretization of advection flux becomes inconsistent, given continuity equation is satisfied

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Convection term
discretisation +
High resolution
schemes

week 5 - High
resolution
schemes +
Temporal
discretisation

week 6 -
Temporal
discretisation +
Discretisation of
the Source Term,
Relaxation and
Other Details

week 7 - Fluid
Flow
Computation:
Incompressible
Flows

week 8 - Fluid
Flow
Computation
and Some
Advanced
Topics

ce De

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 **1 point**
as $Pe = \frac{\rho u \delta x}{\Gamma}$. When does upwind discretization of advection flux becomes inconsistent, given
continuity equation is satisfied

- 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

1 point

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



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



$$\frac{\partial(RHS)}{\partial \phi_c} > 0$$



$$\frac{\partial(RHS)}{\partial \phi_c} = 0$$



Always stable

No, the answer is incorrect.**Score: 0****Accepted Answers:**

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

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