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Courses » Introduction to Finite Volume Methods I

Announcements Course Ask a Question Progress Mentor FAQ

Unit 2 - WEEK1- Introduction and classification of PDEs

Course outline

How to access the portal

WEEK1- Introduction and classification of PDEs

- Introduction to Finite Volume Method
- Governing Equations and Discretization
- Boundary Conditions and Classification of PDEs
- Mathematical Description of fluid flow-I
- Mathematical description of fluid flow-II
- Quiz : Assignment-1
- WEEK 1 - FEEDBACK - Introduction to Finite Volume Methods I
- Solution For Assignment - 1

Assignment-1

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

Due on 2018-09-12, 23:59 IST.

1) Which is not true in the framework of Computational Fluid Dynamics (CFD) ***1 point***

- Numerical solution to the problem whose analytical solution is not available can be found out
- Numerical solutions are safe to obtain which may be unavailable at some points in the domain of interest
- Numerical solution to problems are obtained where conducting experiments is difficult and expensive
- PDEs are converted into a sett of linear system of equations

No, the answer is incorrect.
Score: 0

Accepted Answers:
Numerical solutions are safe to obtain which may be unavailable at some points in the domain of interes

2) Which of the following is true for Finite Volume Method ***1 point***

- The size of each cell should be less than a fixed value described by the Reynolds number
- The size of the smallest cell must be larger than a fixed value described by the Reynolds number
- The size of the smallest cell must be large enough for the governing equations to hold
- Both (a) and (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
The size of the smallest cell must be large enough for the governing equations to hold

3) A rectangular plate (negligible thickness) heated uniformly to a particular temperature, is allowed to cool. For a steady state solution over a Cartesian orthogonal grid, the set of discretized ***1 point***

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WEEK4-Finite Volume Formulation

WEEK5-Finite Volume Mesh properties

WEEK6-Discretization of Diffusion Equation

WEEK7-Discretization of Diffusion Equation and Gradient calculation

WEEK8-Solution of Linear system of equations

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- Both (b) and (c)

No, the answer is incorrect.
Score: 0

Accepted Answers:
Pentadiagonal system

4) Water at 0 deg C is kept inside a an enclosed insulated cylindrical container with an immersion heater in the middle of the container. The heater can maintain a constant temperature of 100 deg C. The whole set-up is rotating at a constant angular velocity about the cylinder axis. At time t=0, the heater is switched on. Which of the following is false ***1 point***

- The temperature at any point inside the container is governed by convection as well as diffusion
- The radial as well as the tangential velocity component is governed by the Dirichlet boundary condition while a Neumann boundary condition can be used for temperature
- The whole system can be simulated using conservation equations by adding a source term in the energy equation only
- The whole system can be simulated using the governing equations by adding a source term in the momentum and energy equations

No, the answer is incorrect.
Score: 0

Accepted Answers:
The whole system can be simulated using conservation equations by adding a source term in the energy equation only

5) Boundary layer theory is based on ***1 point***

- Dirichlet boundary condition for streamwise velocity
- Dirichlet boundary condition for wall normal velocity
- Both (a) and (b)
- Neumann boundary condition for both streamwise as well as wall normal velocity

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both (a) and (b)

6) The pressure perturbation due to a source is known at a point. The propagation of this perturbation through a fluid involves solving ***1 point***

- Elliptic equation
- Hyperbolic equation
- Parabolic equation
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Hyperbolic equation

7) The temperature distribution long a rod heated to a temperature T_0 and allowed to cool is found out using numerical methods . The resulting equation is ***1 point***

- Elliptic for transient solution and parabolic for for steady state solution
- Parabolic for transient solution and elliptic for steady state solution

- Elliptic for transient solution and hyperbolic for steady state solution
- Hyperbolic for transient solution and elliptic for steady state solution

No, the answer is incorrect.
Score: 0

Accepted Answers:
Parabolic for transient solution and elliptic for steady state solution

8) If Grashof number is much larger than the Reynolds number for a fluid flow problem then ***1 point***

- Free convection can be ignored
- Nothing can be said about free convection
- Forced convection can be ignored
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Forced convection can be ignored

9) For a flow with high Reynolds number ***1 point***

- Majority of the flow can be treated as inviscid except near the boundary layer
- The flow is inviscid everywhere
- The flow is inviscid only near a solid boundary
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Majority of the flow can be treated as inviscid except near the boundary layer

10) An effective engine oil has ***1 point***

- Conduction should be dominant in transferring energy
- The value of Prandtl number should be low
- Thermal diffusion should be larger than the momentum diffusion
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
None of the above

Previous Page End