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Courses » Computational Fluid Dynamics

Announcements

Course

Ask a Question

Progress

FAQ



Unit 13 - Week 12

Course outline

How to access the portal

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

Lecture 56 : "Illustrative examples on the use of SIMPLE algorithm "

Lecture 57 : "SIMPLER algorithm "

Lecture 58 : "Illustrative examples of SIMPLER algorithm "

Lecture 59 : "What is there in implementing a CFD Code "

Lecture 60 : "Some representative case studies "

Quiz : Week 12 assignment 12

Download Videos

Assignment Solution

Week 12 assignment 12

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

Due on 2018-10-24, 23:59 IST

1 point

1)

Let us consider the problem of lid-driven cavity with U as the velocity of the lid. The domain is divided using a collocated grid system with n_x and n_y grid points (Δx and Δy are the grid spacing along x and y direction) along the x and y direction such that the nodes from the left to the right boundary vary from 1 to n_x while the nodes from the bottom to the top boundary vary from 1 to n_y . If the generalized representation of node variation along the x and y direction are given by i and j then the discretized equation for the velocity boundary condition at the lid using the central difference scheme will result in the stream function equation as

(a) $\psi_{i,j} = U\Delta y$

(b) $\psi_{i,j} = 2U\Delta y - \Psi_{i,j+1}$

(c) $\psi_{i,j} = 2U\Delta y + \Psi_{i,j-1}$

(d) $\psi_{i,j} = U\Delta y + \Psi_{i,j-1}$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

2)

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

3)

The SIMPLER algorithm starts

(a) With a guessed velocity field

(b) With a guessed pressure field

(c) With guessed values for both pressure and velocity field

(d) With the solution for the values at the nodes adjacent to the known boundary.

1 point

1 point

Live Session - Sep
13,2018

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

4)

Choose the correct statement regarding SIMPLE and SIMPLER algorithm

- (a) In the SIMPLER algorithm, the pressure correction equation is used for correcting the velocity field and improving the pressure field.
- (b) If the correct velocity field and a guessed pressure field were used to start an iteration in SIMPLE algorithm then it would lead to faster convergence.
- (c) If the guessed velocity field happens to be the correct velocity field, then the pressure correction equation in SIMPLER algorithm will produce the correct pressure field in one iteration.
- (d) The SIMPLER algorithm requires more number of iterations and computational effort than the SIMPLE algorithm.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

5) Which of the following is correct in case of SIMPLER algorithm?

- (a) Pressure correction is used to obtain the correct pressure only
- (b) Pressure correction is used to obtain the correct pressure and velocity
- (c) Pressure correction is used to obtain the correct velocity
- (d) Pressure correction is used to obtain the velocity correction only

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

d

6)



1 point

1 point

1 point

Consider a two-dimensional steady convection-diffusion problem with the control volume as shown in Fig. 1. The discretized form of the momentum equations are given as: $u_e = d_e(p_p - p_E)$ and $v_n = d_n(p_p - p_N)$. Given that: $\Delta x = \Delta y = 1$, $u_w = 40$, $v_s = 10$, $p_N = 0$, $p_E = 8$, $d_e = 1$ and $d_n = 0.5$. What will be the value of u_e and v_n using SIMPLE algorithm? Assume $p_w^* = 20$, $p_s^* = 20$ and $p_p^* = 15$.

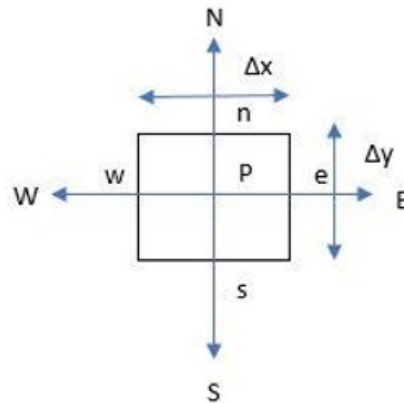


Fig. 1.

- (a) 20.67 and 19.335
 (b) 30.67 and 19.335
 (c) 20.67 and 16.335
 (d) 30.67 and 16.335

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

7)

1 point

Match List A with List B:

List A	List B
(A) Creating geometry	(i) Pre-processor
(B) Initializing the solution	(ii) Solver
(C) Creating contour plots	(iii) Post-processor

The correct match is:

- (a) (A)-(i), (B)-(ii), (C)-(i)
 (b) (A)-(i), (B)-(ii), (C)-(iii)
 (c) (A)-(i), (B)-(ii), (C)-(ii)
 (d) (A)-(i), (B)-(i), (C)-(iii)

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

8)

1 point

In which of the following cases user defined code is not required?

- (a) For defining temperature dependent thermo-physical properties
- (b) For using variable time step
- (c) For providing different constant values of velocities at the inlet of a computation domain
- (d) For assigning complicated body force terms.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

9)

If a mesh size with n_x and n_y grid points along the X- and Y-directions are used discretize a computational domain then the limits of the **do**-loop for i and j respective while writing user-defined subroutine for implementing a source term in the momentum equation should be

- (a) 1, n_x and 1, n_y
- (b) 3, n_x and 2, n_y-1
- (c) 2, n_x-1 and 3, n_y-1
- (d) 3, n_x-1 and 2, n_y-1

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

d

10)

Which of the following statement is incorrect?

- (a) A structured grid contains strictly same connectivity between neighboring vertices
- (b) Grid points (or vertices) can be specified by three indices (i, j, k) for 3-D problem and 2 indices (i, j) for 2-D problem in case of structured grid.
- (c) Grid points (or vertices) can be specified by three indices (i, j, k) for 3-D problem and 2 indices (i, j) for 2-D problem in case of unstructured grid.
- (d) Unstructured grids are necessary to handle the complicated nature of the domain boundary.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c



1 point

1 point

Previous Page

End

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