Week 12 assignment 12

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

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 $nx$ and $ny$ grid points ($\Delta x$ and $\Delta y$ 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 $nx$ while the nodes from the bottom to the top boundary vary from 1 to $ny$. If the generalized representation of no 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) $\psi_{i+1,j} = U \Delta y$
(b) $\psi_{i,j+1} = 2U \Delta y - \psi_{i+1,j+1}$
(c) $\psi_{i,j+1} = 2U \Delta y + \psi_{i+1,j+1}$
(d) $\psi_{i+1,j+1} = U \Delta y + \psi_{i,j+1}$

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

2) 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.

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.
4) Choose the correct statement regarding SIMPLE and SIMPLER algorithm
(a) In the SIMPLER algorithm, the pressure correction equation is used for correcting 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.

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
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: 
\[ u_e = d_e (p_p - p_e) \quad \text{and} \quad v_n = d_n (p_p - p_n). \]

Given that: \( \Delta x = \Delta y \) 
\( u_w = 40, v_s = 10, p_N = 0, p_E = 8, d_e = 1 \) and \( d_n = 0.5 \). What will be the value of \( u_e \) and using SIMPLE algorithm? Assume \( p_w^* = 20, p_s^* = 20 \) and \( p_p^* = 15 \).

![Fig. 1.](image)

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

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

7) Match List A with List B:

<table>
<thead>
<tr>
<th>List A</th>
<th>List B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Creating geometry</td>
<td>(i) Pre-processor</td>
</tr>
<tr>
<td>(B) Initializing the solution</td>
<td>(ii) Solver</td>
</tr>
<tr>
<td>(C) Creating contour plots</td>
<td>(iii) Post-processor</td>
</tr>
</tbody>
</table>

The correct match is:
(a) (A)-(i), (B)-(ii), (C)-(i)
(b) (A)-(i), (B)-(iii), (C)-(iii)
(c) (A)-(i), (B)-(ii), (C)-(ii)
(d) (A)-(i), (B)-(i), (C)-(iii)

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

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

If a mesh size with nx and ny grid points along the X- and Y-directions are used to 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, nx and 1, ny
(b) 3, nx and 2, ny-1
(c) 2, nx-1 and 3, ny-1
(d) 3, nx-1 and 2, ny-1

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

Which of the following statement in 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.

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