Unit 11 - Week 9: MAC Algorithm

Assignment 9

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

Due on 2020-04-01, 23:59 IST.

1) What discretization scheme is used in MAC algorithm? *1 point*

- Forward Time Backward Space
- Forward Time Forward Space
- Backward Time Forward Space
- Forward Time Central Space

No, the answer is incorrect.
Score: 0

Accepted Answers:
Forward Time Central Space

2) The pressure correction formula at main grid point P in MAC algorithm is *1 point*

- $p'_P = -\frac{\frac{\tilde{u}_P - \tilde{u}_W}{\Delta x} + \frac{\tilde{v}_P - \tilde{v}_S}{\Delta y}}{\frac{2\Delta t}{\rho}\left[\frac{1}{\Delta x^2} + \frac{1}{\Delta y^2}\right]}$
- $p'_P = -\frac{\frac{\tilde{u}_P - \tilde{u}_W}{\Delta x} + \frac{\tilde{v}_P - \tilde{v}_S}{\Delta y}}{\frac{\Delta t}{\rho}\left[\frac{1}{\Delta x^2} + \frac{1}{\Delta y^2}\right]}$
- $p'_P = -\frac{\frac{\tilde{u}_E - \tilde{u}_W}{\Delta x} + \frac{\tilde{v}_N - \tilde{v}_S}{\Delta y}}{\frac{\Delta t}{\rho}\left[\frac{1}{\Delta x^2} + \frac{1}{\Delta y^2}\right]}$
- $p'_P = -\frac{\frac{\tilde{u}_E - \tilde{u}_W}{\Delta x} + \frac{\tilde{v}_N - \tilde{v}_S}{\Delta y}}{\frac{2\Delta t}{\rho}\left[\frac{1}{\Delta x^2} + \frac{1}{\Delta y^2}\right]}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$p'_P = -\frac{\frac{\tilde{u}_P - \tilde{u}_W}{\Delta x} + \frac{\tilde{v}_P - \tilde{v}_S}{\Delta y}}{\frac{2\Delta t}{\rho}\left[\frac{1}{\Delta x^2} + \frac{1}{\Delta y^2}\right]}$

3) In order to accelerate p'_P calculation in MAC method, which of the following is correct? *1 point*

- Under-relaxation factor is used
- Over-relaxation factor is used
- Any relaxation factor cannot be used
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Over-relaxation factor is used

4) The pressure gradient term in x-momentum equations is discretized at main grid point P in MAC algorithm as *1 point*

- $-\frac{\partial p}{\partial x} = -\frac{1}{\Delta x}(p_E - p_W)$
- $-\frac{\partial p}{\partial x} = -\frac{1}{2\Delta x}(p_E - p_W)$
- $-\frac{\partial p}{\partial x} = -\frac{1}{\Delta x}(p_E - p_P)$
- $-\frac{\partial p}{\partial x} = -\frac{1}{2\Delta x}(p_E - p_P)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$-\frac{\partial p}{\partial x} = -\frac{1}{\Delta x}(p_E - p_P)$

5) The u-velocity is updated at grid point P in MAC algorithm as *1 point*

- $u_P^{n+1} = \tilde{u}_P - \frac{\Delta t}{2\rho\Delta x}\left(p'_E - p'_P\right)$
- $u_P^{n+1} = \tilde{u}_P - \frac{\Delta t}{\rho\Delta x}\left(p'_E - p'_P\right)$
- $u_P^{n+1} = \tilde{u}_P - \frac{\Delta t}{2\rho\Delta x}\left(p'_E - p'_W\right)$
- $u_P^{n+1} = \tilde{u}_P - \frac{\Delta t}{\rho\Delta x}\left(p'_E - p'_W\right)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$u_P^{n+1} = \tilde{u}_P - \frac{\Delta t}{\rho\Delta x}\left(p'_E - p'_P\right)$

6) The collocated grid is used to discretize the unsteady Navier-Stokes equations in MAC algorithm. *1 point*

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

7) Three-dimensional unsteady Navier-Stokes equations can be solved using MAC algorithm. *1 point*

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True

8) The (u, v, p) system is known as the "primitive variable" system. *1 point*

- True
- False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True