Unit 6 - Week 5

Assignment 5

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

Due on 2020-03-04, 23:59 IST.

Refer table for Symbols

Symbols

ρ	Density
τ	Flow shear stress
t	Time
x_i	Directions (i=1,2,3)
k	Turbulent kinetic energy
ε	Turbulent dissipation energy
x,y,z	Cartesian space coordinate
p	Pressure
u,v,w	Velocity components in x,y,z direction
$\frac{D}{Dt}$	Substantive or total derivative
μ_t	Turbulent viscosity
S_M	Momentum source term
S_{ij}	Mean components of deformation
τ_{ij}	Viscous stresses
l_m	Mixing length
U	Time average components of velocity (u,v,w)

1) In a pipe flow, if critical Reynold number is less than 2000, then flow is *1 point*

- Laminar
- Turbulent
- Vortex
- None of the above

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

2) In flow along solid boundaries, ... dominates near the wall whereas...... dominates far from the wall *1 point*

- Inertia force and Viscous force
- Viscous force and Inertia force
- Inertia force and gravitational force
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
Viscous force and Inertia force

3) Due to fluctuating velocity component, the fluid layers experience additional turbulent shear stresses, known as *1 point*

- Viscous stresses
- Shear stresses
- Reynold stresses
- None of the above

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

4) There is momentum exchange due to convective transport by the eddies which causes faster moving fluid layers to be ....and slower moving fluid layers to be .... *1 point*

- Decelerated and Accelerated
- Accelerated and Decelerated
- Slower and Faster
- None of the above

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

5) When there is no change in fluid property at a point with time, it implies that flow is *1 point*

- Vortex flow
- Turbulent flow
- Steady flow
- None of the above

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

6) Advantage(s) of k-ε model equation is/are *1 point*

- Simplest turbulence model for which only initial and/ or boundary conditions need to be supplied
- Excellent performance for many industrially relevant flows
- Well established, the most widely validated turbulence model
- All of the above

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

7) k equation in standard k-ε turbulence model is *0 points*

- $\frac{\partial(\rho k)}{\partial t} + \nabla.(\rho\, kU) = \nabla.[\frac{\mu_t}{\sigma_k}\nabla\, \mathrm{k}] + 2\mu_t S_{ij}S_{ij} - \rho k$
- $\frac{\partial(\rho k)}{\partial t} + \nabla.(\rho\, kU) = \rho\, k$
- $\frac{\partial(\rho k)}{\partial t} = 2\mu_t S_{ij}S_{ij} - \rho\, k$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\partial(\rho k)}{\partial t} + \nabla.(\rho\, kU) = \nabla.[\frac{\mu_t}{\sigma_k}\nabla\, \mathrm{k}] + 2\mu_t S_{ij}S_{ij} - \rho k$

8) ε equation in standard k-ε turbulent model is *1 point*

- $\frac{\partial(\rho\varepsilon)}{\partial t} = \nabla.\left[\frac{\mu_t}{\sigma_k}\nabla\varepsilon\right] + C_{1\varepsilon}\frac{\varepsilon}{k}2\mu_t S_{ij}.S_{ij} - C_{2\varepsilon}\rho\frac{\varepsilon^2}{k}$
- $\frac{\partial(\rho\varepsilon)}{\partial t} + \nabla.(\rho\varepsilon\, U) = \nabla.\left[\frac{\mu_t}{\sigma_k}\nabla\varepsilon\right] + C_{1\varepsilon}\frac{\varepsilon}{k}2\mu_t S_{ij}.S_{ij} - C_{2\varepsilon}\rho\frac{\varepsilon^2}{k}$
- $\frac{\partial(\rho\varepsilon)}{\partial t} + \nabla.\left[\frac{\mu_t}{\sigma_k}\nabla\varepsilon\right] = C_{1\varepsilon}\frac{\varepsilon}{k}2\mu_t S_{ij}.S_{ij} - C_{2\varepsilon}\rho\frac{\varepsilon^2}{k}$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\partial(\rho\varepsilon)}{\partial t} + \nabla.(\rho\varepsilon\, U) = \nabla.\left[\frac{\mu_t}{\sigma_k}\nabla\varepsilon\right] + C_{1\varepsilon}\frac{\varepsilon}{k}2\mu_t S_{ij}.S_{ij} - C_{2\varepsilon}\rho\frac{\varepsilon^2}{k}$

9) For an incompressible fluid, according to Newton's law of viscosity, the viscous stresses are taken to be proportional to *1 point*

- $\frac{\partial u_i}{\partial x_i} + \frac{\partial u_j}{\partial u_j}$
- $\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial u_i}$
- $\frac{\partial u_i}{\partial x_j}$
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\partial u_i}{\partial x_j} + \frac{\partial u_j}{\partial u_i}$

10) In turbulent flow,..........force is much higher than ....force *1 point*

- Viscous and inertia
- Inertia and gravitation
- Inertia and viscous
- None of the above

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