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NPTEL

Courses » Fundamentals Of Combustion (Part 1)

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Unit 9 - Week 8 : Conservation Equations

Course outline

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Week 1 : Introduction to Combustion

Week 2 : Thermodynamics of combustion

Week 3 : Themochemistry

Week 4 : Chemical Equilubrium and Kinetics

Week 5 : Chemical Kinetics

Week 6 : Types of reaction and Introduction to Physics of combustion

Week 7 : Transport Phenomena

Week 8 : Conservation Equations

● Lecture 36 Introduction to mass transfer

● Lecture 37 Species transport equation

● Lecture 38 Energy

Week 8 Assessment 8

The due date for submitting this assignment has passed. **Due on 2018-04-04, 23:59 IST.**

Submitted assignment (Submitted on 2018-03-26, 05:32)

1) Turbulent flow is characterized by   *1 point*

○ Randomness
○ Non-linearity
○ Diffusivity
○ All the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All the above

2) Turbulent eddies are,   *1 point*

○ Pattern within a flow field which is correlated over a particular region in space and time
○ The identity of structures will be correlated within this region
○ Any fluctuating quantity that is correlated in a space of flow
○ All the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Pattern within a flow field which is correlated over a particular region in space and time

3) The main objective of boundary layer control is   *1 point*

○ Control of flow separation
○ Reduction of drag force
○ Reduction of lift force
○ Both (a) and (b)

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both (a) and (b)

4) The smallest hydrodynamic scale in turbulent flow is   *1 point*

○ Kolmogorov length scale
○ Taylor microscale
○ Integral length scale

○ None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Kolmogorov length scale

5) Reynolds number estimate for the ratio of the largest to smallest length scales in the   ***1 point***
flow is approximately,

○ $Re^{1/4}$
○ $Re^{1/2}$
○ $Re^{3/4}$
○ $Re^{5/4}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$Re^{3/4}$

6) Boundary layer theory is/are applicable to,   ***1 point***

○ Two-dimensional laminar jet flows
○ Impulsively started plate
○ Thin flat plate on a uniform flow field
○ All the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Two-dimensional laminar jet flows

7) Helium at 20°C and low-pressure flow past a thin flat plate of 1m long and 3m wide.   ***4 points***
The total frictional drag desired is 0.5N. What is the approximate pressure of helium if velocity is 30
m/s,

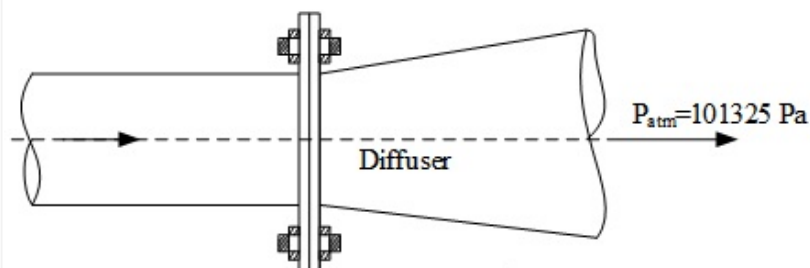○ 12080.85
○ 18020.85
○ 16202.75
○ 12602.75

No, the answer is incorrect.
Score: 0

Accepted Answers:
18020.85

8) The diffuser with an outlet diameter two times that of pipe is bolted to the pipe through ***3 points***
which water enters with a gauge pressure of 75kPa, a velocity of 16 m/s and rate of 0.25
m^3/s.Neglect the frictional forces.The force exerted on the bolts due to water flow is

○ 2371.87
○ 2471.87
○ 2571.87
○ 2671.87

No, the answer is incorrect.
Score: 0

Accepted Answers:
2671.87

9) Consider a well-stirred reactor in which the fuel and oxidizer are mixed thoroughly,   **5 points**
operating at 1 atm with fuel, oxidizer and a single product species. The reactants consisting of fuel
(Y_F = 0.3) and oxidizer Y_{Ox} =0.7 at 298 K, flow into the 0.004 m^3 reactor at 0.75 kg/s has a heat
loss of 1750W. Assume the following simplified thermodynamic properties: c_p= 1200J/kg-K (all
species), *MW*=28 kg/kmol (all species), $h^0_{f,F} = -1500\,kJ/kg$, $h^0_{f,Ox} = 0$, and $h^0_{f,Pr} = -3500\,kJ/kg$.
The fuel and oxidizer mass fractions in the outlet stream are 0.002 and 0.004,
respectively. Determine temperature in the reactor

- ○ 2524.72
- ○ 2822.72
- ○ 3120.72
- ○ 3554.72

No, the answer is incorrect.
Score: 0

Accepted Answers:
2822.72

10)Determine the residence time for the above question in milliseconds inside the reactor **2 points**

- ○ 0.445
- ○ 0.545
- ○ 0.645
- ◉ 0.745

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.645

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