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Courses » Transport Phenomena of Non-Newtonian Fluids

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Unit 10 - Week 8: Heat Transfer Phenomena of Non-Newtonian Fluids

Register for Certification exam

Course outline

How to access the portal

Week 00

Week 1: Introduction of Non-Newtonian Fluids

Week 2: Rheology Measuring Instruments

Week 3: Equations of Change

Week 4: Momentum Transfer of Non-Newtonian Fluids

Week 5: Momentum Transfer of Non-Newtonian Fluids

Week 6: Flow of Non-Newtonian Fluids though

Week 08 Assignment 01

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2019-03-27, 23:59 IST.**

1) Consider transpiration cooling system by two shells of spheres with radial gas mass flow **15 points** rate of 10^{-5} g/s for the following conditions: $R = 500\mu\text{m}$, $\lambda_R = 100\mu\text{m}$, $T_1 = 300^\circ\text{C}$, $T_\lambda = 100^\circ\text{C}$, $k = 6.13 \times 10^{-5}$ Cal/cm.s. $^\circ\text{C}$, $C_p = 0.25$ Cal/g $^\circ\text{C}$. What is the rate of heat transfer (in Cal/s) at inner sphere shell?

- 5.62×10^{-16}
- 2.62×10^{-15}
- 1.86×10^{-17}
- 3.14×10^{-14}

No, the answer is incorrect.

Score: 0

Accepted Answers:

2.62×10^{-15}

2) Consider transpiration cooling system by two shells of spheres without any radial gas mass flow for the following conditions: $R = 500\mu\text{m}$, $\lambda_R = 100\mu\text{m}$, $T_1 = 300^\circ\text{C}$, $T_\lambda = 100^\circ\text{C}$, $k = 6.13 \times 10^{-5}$ Cal/cm.s. $^\circ\text{C}$, $C_p = 0.25$ Cal/g $^\circ\text{C}$. What is the rate of heat removal (in Cal/s) at inner sphere shell? **10 points**

- 7.482×10^{-3}
- 3.521×10^{-4}
- 1.925×10^{-3}
- 9.421×10^{-4}

No, the answer is incorrect.

Score: 0

Accepted Answers:

1.925×10^{-3}

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Week 8: Heat Transfer Phenomena of Non-Newtonian Fluids

Lecture 1: Temperature Distribution in Fluids Confined Between Two Cylinders

Lecture 2: Heat Conduction from Sphere Without and With Reaction; and in Spherical Shell

Lecture 3: Transpiration Cooling

Quiz : Week 08 Assignment 01

Assignment solution

Week 9: Mass Transfer Phenomena of Non-Newtonian Fluids

Interaction Session

Week 10: Simultaneous Heat and Mass Transfer with Chemical Reactions

Week 11: Mass Transfer Combined with Heat Transfer

Week 12: Boundary Layer Flows of Non-Newtonian Fluids

237

No, the answer is incorrect.

Score: 0

Accepted Answers:

337

4) Calculate temperature (in °C) at $r = 300\mu\text{m}$ point in between two shells of spheres used for transpiration cooling purpose without radial gas mass flow rate for the following conditions: $R = 500\mu\text{m}$, $\lambda_R = 100\mu\text{m}$, $T_1 = 300^\circ\text{C}$, $T_\lambda = 100^\circ\text{C}$, $k = 6.13 \times 10^{-5} \text{ cal/cm.s.}^\circ\text{C}$, $C_p = 0.25 \text{ cal/g}^\circ\text{C}$ **10 points**

303.2

313.2

353.2

333.2

No, the answer is incorrect.

Score: 0

Accepted Answers:

333.2

5) Consider a spherical catalyst pellet (of radius 2mm) of thermal conductivity $2.1 \times 10^{-6} \text{ Cal/cm.s.}^\circ\text{C}$. Inside the pellet a chemical reaction is taking place with rate of heat generation $4.652 \times 10^{-3} \text{ Cal/s.cm}^3$. This heat is lost to the outer surface and then to surrounding gas stream by convection with heat transfer coefficient of $7.168 \times 10^{-5} \text{ Cal/cm}^2.\text{s}^\circ\text{C}$. If gas stream temperature is 30°C , what is the maximum temperature (in °C) at the centre of catalyst pellet? **10 points**

49.09

39.09

35.09

31.09

No, the answer is incorrect.

Score: 0

Accepted Answers:

49.09

6) Consider a spherical catalyst pellet (of radius 2mm) of thermal conductivity $2.1 \times 10^{-6} \text{ Cal/cm.s.}^\circ\text{C}$ is maintained in hot conditions at 100°C surface temperature. This heat is lost to the surrounding stagnant gas which is at 30°C by conduction. What is the temperature (in °C) at a distance 10mm from the centre of catalyst pellet? **5 points**

92

80

80

44

No, the answer is incorrect.

Score: 0

Accepted Answers:

44

7) Consider a spherical catalyst pellet of radius 2mm is maintained in hot conditions at 100°C surface temperature. This heat is lost to the surrounding stagnant gas which is at 30°C by conduction. What is the value of the Nusselt number for this case? **5 points**


4

3

2
 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
2



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