

Unit 2 - Week 1

Course outline

How does an NPTEL online course work?

Week 1

- Lecture 1: Introduction
- Lecture 2: Balance of Total Energy
- Lecture 3: Different Forms of Thermal Energy Equation
- Lecture 4: Thermal Boundary Layer
- Lecture 5: Forced Convection: Low Prandtl Number over a Flat Plate

Quiz : Assignment 1

Solution : Assignment 1

Week 2

Week 3

Week 4

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Assignment 1

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.

- 1) Which mode of heat transfer involves bulk movement of the medium? 1 point
- Conduction
 - Convection
 - Radiation
 - All three

No, the answer is incorrect.
Score: 0

Accepted Answers:
Convection

- 2) Viscous dissipation (ϕ) can be expressed as 1 point
- $\pi_{ji} d_{ij}$
 - $\pi_{ji} r_{ij}$
 - $\pi_{ji} \delta_{ij}$
 - $-p \delta_{ij}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\pi_{ji} d_{ij}$

- 3) Identify the correct form of equation 1 point
- $dh = c_p + (1 - \beta T) dP / \rho$
 - $dh = c_p + (1 + \beta T) dP / \rho$
 - $dh = c_p - (1 - \beta T) dP / \rho$
 - $dh = c_p - (1 + \beta T) dP / \rho$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $dh = c_p + (1 - \beta T) dP / \rho$

- 4) A thermocouple having emissivity 0.3 measures the temperature in a chamber with black walls. Consider that air around a thermocouple is at 20 °C, the walls are at 300 °C and heat transfer coefficient between the thermocouple and air is 75 W/(m² K). What temperature will the thermocouple read if the system is in steady state. 1 point
- 300 °C
 - 20 °C
 - 42.21 °C
 - 29.45 °C

No, the answer is incorrect.
Score: 0

Accepted Answers:
42.21 °C

- 5) You need to insulate a boiler chamber using concrete slab. Client gave you data of average temperature of boiler and ambient as 300 °C and 20 °C, respectively. Calculate the thickness of slab needs to be prepared. Take thermal conductivity of slab as 1 W/m-K and heat transfer coefficient as 12 W/m²-K. Maximum allowable temperature of the slab coated boiler can be 120 °C. 1 point
- 100 mm
 - 50 mm
 - 150 mm
 - 20 mm

No, the answer is incorrect.
Score: 0

Accepted Answers:
150 mm

- 6) A room is electrically heated. Its roof is 6 m long, 8 m wide and 0.25 m thick. It is made of flat layer of concrete having thermal conductivity 0.8 W/m-K. The temperatures of inner and outer surfaces of the roof are measured to be 25 °C and 4 °C, respectively, for a period of 6 hrs. Determine total amount of heat loss from the home during the specified period. 1 point
- 69.67×10^6 J
 - 16.53×10^6 J
 - 16900 J
 - 10.41×10^5 J

No, the answer is incorrect.
Score: 0

Accepted Answers:
 69.67×10^6 J

- 7) If thermal entrance region is found to be lengthier than hydrodynamic entrance region for a flow inside heated pipe line, then find out the correct statement. 1 point
- Kinematic viscosity < thermal diffusivity
 - Kinematic viscosity > thermal diffusivity
 - Cannot be determined
 - Kinematic viscosity = thermal diffusivity

No, the answer is incorrect.
Score: 0

Accepted Answers:
Kinematic viscosity > thermal diffusivity

- 8) For cooling an electrical pane, air at 25 °C flows over a 0.6 m long panel at 2 m/s. Panel is releases heat of 500 W/m² to the air. What can be the maximum temperature of the panel? Use correlation $Nu_x = 0.453 Re_x^{1/2} Pr^{1/3}$ Properties of air are given as: Pr=0.709, $\nu = 1.784 \times 10^{-5}$ m²/s, k=0.0278 W/mK. 1 point
- 150 °C
 - 25 °C
 - 128 °C
 - 87.3 °C

No, the answer is incorrect.
Score: 0

Accepted Answers:
128 °C

- 9) A copper block having temperature 120 °C is exposed to ambient at 25 °C. It has been found that rate of heat transfer from copper block is 1500 W/m². Find the average heat transfer coefficient. 1 point
- 11.6 W/m²
 - 15.8 W/m²
 - 56 W/m²
 - 19.3 W/m²

No, the answer is incorrect.
Score: 0

Accepted Answers:
15.8 W/m²

- 10) Kinematic viscosity and thermal diffusivity of engine oil can be taken as 200 mm²/s and 0.0738 mm²/s, respectively. If engine oil is allowed to flow over a heated flat plate. Comment out of two boundary layers, which will be thicker. 1 point
- Thermal boundary layer
 - Cannot be decided
 - Hydrodynamic boundary layer
 - Both will have same thickness

No, the answer is incorrect.
Score: 0

Accepted Answers:
Hydrodynamic boundary layer