

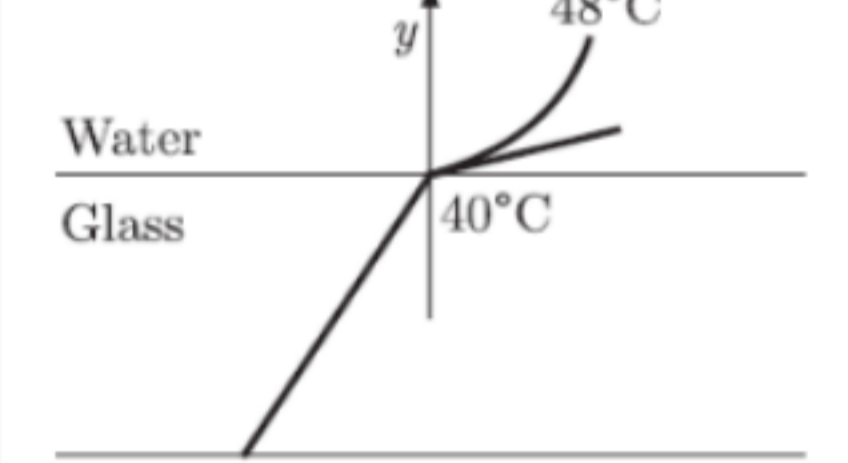
Unit 10 - week 8

Course outline
How to access the portal
Week 1
Week 2
Week 3
Week 4
Week 5
Week 6
Week 7
week 8
<input checked="" type="radio"/> Conduction cases – transient state <input type="radio"/> Convective heat transfer <input type="radio"/> Quiz : Assignment 8 <input type="radio"/> Transport Phenomena In Materials : Week 8 - Feedback
Week 9
Week 10
Week 11
Week 12
DOWNLOAD VIDEOS

Assignment 8

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

Due on 2019-09-25, 23:59 IST.

- 1) In the lumped heat capacity model, what is the nature of variation of temperature with time? 1 point
- Linear
 Exponential
 Sinusoidal
 Logarithmic
- No, the answer is incorrect.**
Score: 0
Accepted Answers: Exponential
- 2) In the non-dimensional parameter named Biot number, the characteristics length defined as a the ratio of ... 1 point
- Perimeter to surface area of solid
 Surface area to diameter of solid
 Surface area to volume of solid
 Volume of solid to its surface area
- No, the answer is incorrect.**
Score: 0
Accepted Answers: Volume of solid to its surface area
- 3) During heat treatment, cylindrical pieces of 25 mm diameter, 30 mm height and at 30°C are placed in a furnace at 750°C with convective coefficient $80\text{W}/(\text{m}^2\text{K})$. Pick the option closest to the time required (in seconds) to heat the pieces to 600°C . Assume the following property values: Density = $7850\text{kg}/\text{m}^3$ Specific heat = $480\text{J}/(\text{kgK})$ Thermal conductivity = $40\text{W}/(\text{mK})$ 1 point
- 226
 480
 126
 800
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 480
- 4) For a thin flat plate (thickness t , breadth b and height h) the heat exchange across the thickness occurs from both the faces of the plate. The characteristics length is equal to 1 point
- $t/4$
 $t/3$
 $t/2$
 t
- No, the answer is incorrect.**
Score: 0
Accepted Answers: $t/2$
- 5) A small copper ball of 5 mm diameter at 500 K is dropped into an oil bath whose temperature is 300K. The thermal conductivity of copper is $400\text{W}/(\text{mK})$, its density $9000\text{kg}/\text{m}^3$ and its specific heat $385\text{J}/(\text{kgK})$. If the heat transfer coefficient is $250\text{W}/(\text{m}^2\text{K})$ and lumped analysis is assumed to be valid, the rate of fall of the temperature of the ball at the beginning of cooling will be, in K/s is 1 point
- 8.7
 13.9
 17.3
 27.7
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 17.3
- 6) The properties of mercury at 300K are: density = $13529\text{kg}/\text{m}^3$, specific heat at constant pressure = $0.1393\text{kJ}/(\text{kgK})$, dynamic viscosity = $0.1523 \times 10^{-2}\text{N}\cdot\text{s}/\text{m}^2$ and thermal conductivity = $8.540\text{W}/(\text{mK})$. The Prandtl number of the mercury at 300K is 1 point
- 2.48
 0.0248
 24.8
 248
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 0.0248
- 7) For the fully developed laminar flow and heat transfer in a uniformly heated long circular tube, if the flow velocity is doubled and the tube diameter is halved, the heat transfer coefficient will be 1 point
- Half of the original value
 Double of the original value
 Same as before
 Four times of the original value
- No, the answer is incorrect.**
Score: 0
Accepted Answers: Double of the original value
- 8) Consider steady one-dimensional heat flow in a plate of 20 mm thickness with a uniform heat generation of $80\text{MW}/\text{m}^3$. The left and right faces are kept at constant temperatures of 160°C , and 120°C respectively. The plate has a constant thermal conductivity of $200\text{W}/(\text{mK})$. The location of maximum temperature within the plate from its left face is 1 point
- 15 mm
 5 mm
 10 mm
 0 mm
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 5 mm
- 9) With a solidification factor of $0.97 \times 106\text{s}/\text{m}^2$, the solidification time (in seconds) for a spherical casting of 200 mm diameter is 1 point
- 539
 4311
 1078
 3233
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 1078
- 10) In a sand casting process a sphere and a cylinder of equal volumes are separately cast from same molten metal under identical conditions. The height and diameter of cylinder are equal. The solidification time of sphere to that of cylinder is 1 point
- 1.14
 0.87
 1.31
 0.76
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 1.31
- 11) A cube shaped casting solidifies in 5 min. The solidification time in min for a cube of the same material, which is 8 times heavier than the original casting, will be 1 point
- 10
 20
 24
 40
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 20
- 12) A solid copper ball of mass 500 gram, when quenched in a water bath at 30°C , cools from 530°C to 430°C in 10 seconds. What will be the temperature of the ball after the next 10 seconds? 1 point
- 300°C
 320°C
 350°C
 400°C
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 350°C
- 13) For steady, uniform flow through pipes with constant heat flux supplied to the wall, what is the value of Nusselt number? 1 point
- 11/48
 48/11
 24/11
 11/24
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 48/11
- 14) Which one of the following dimensionless numbers represents the ratio of kinematic viscosity to the thermal diffusivity? 1 point
- Nusselt number
 Grashoff number
 Prandtl number
 Reynolds number
- No, the answer is incorrect.**
Score: 0
Accepted Answers: Prandtl number
- 15) In the given figure below the Heat is being transferred by convection from water at 48°C to a glass plate whose surface that is exposed to the water is at 40°C . The thermal conductivity of water is $0.6\text{W}/(\text{mK})$ and the thermal conductivity of glass is $1.2\text{W}/(\text{mK})$. The spatial gradient of temperature in the water at the water-glass interface is $dT/dy = 1 \times 10^4\text{K}/\text{m}$. The value of the temperature gradient in the glass at the water-glass interface in K/m is 1 point
- 
- -2×10^4
 0.5×10^4
 2×10^4
 0.0
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 0.5×10^4
- 16) A fluid of thermal conductivity $1.0\text{W}/(\text{mK})$ flows in fully developed flow with Reynolds number of 1500 through a pipe of diameter 10 cm. The heat transfer coefficient for uniform heat flux condition is 1 point
- 4.364
 43.64
 36.57
 3.657
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 43.64
- 17) The velocity and temperature distribution in a pipe flow is given by $u(r)$ and $T(r)$. If u_m is the mean velocity at any section of pipe, the bulk mean temperature at that section is 1 point
- $\int_0^R u(r)T(r)r^2 dr$
 $\frac{2}{u_m R^2} \int_0^R u(r)T(r)r dr$
 $\int_0^R u(r)T(r)r dr$
 $\frac{2}{u_m R^2} \int_0^R u(r)T(r)r^2 dr$
- No, the answer is incorrect.**
Score: 0
Accepted Answers: $\frac{2}{u_m R^2} \int_0^R u(r)T(r)r dr$
- 18) Under same condition the ratio of Nusselt number to Biot number is 1 point
- 1
 Thermal conductivity of fluid / Thermal conductivity of solid
 Depends on geometry of problem
 Thermal conductivity of solid / Thermal conductivity of fluid
- No, the answer is incorrect.**
Score: 0
Accepted Answers: Thermal conductivity of solid / Thermal conductivity of fluid
- 19) In the casting of steel under certain mold conditions, the mold constant in Chvorinov's Rule is known to be $4.0\text{min}/\text{cm}^2$, based on previous experience. The casting is a flat plate whose length = 30 cm, width = 10 cm, and thickness $h = 20\text{mm}$. Pick the option closest to the time taken (in minutes) for the casting to solidify will be 1 point
- 40
 4
 0.04
 400
- No, the answer is incorrect.**
Score: 0
Accepted Answers: 4
- 20) Three solid objects of the same material and of equal masses—a sphere, a cylinder (length = diameter) and a cube are at 500°C initially. These are dropped in a quenching bath containing a large volume of cooling oil each attaining the bath temperature eventually. The time required for 90 percent change of temperature is smallest for 1 point
- Cylinder
 Sphere
 Cube
 Equal for all the three
- No, the answer is incorrect.**
Score: 0
Accepted Answers: Cube