Multiple Choice questions

- **What is the primary mode of heat transfer in a solid plane wall?**

  - A) Conduction
  - B) Convection
  - C) Radiation
  - D) Advection

  Answer: A) Conduction

- **In a cylindrical system, which equation represents steady-state heat conduction?**

  - A) Fourier's Law
  - B) Newton's Law of Cooling
  - C) Stefan-Boltzmann Law
  - D) Poiseuille's Law

  Answer: A) Fourier's Law

- **The critical thickness of insulation for a cylindrical pipe occurs when:**

  - A) The insulation thickness increases heat loss.
  - B) The heat loss is minimized.
  - C) The thermal resistance is zero.
  - D) The thermal conductivity is maximum.

  Answer: B) The heat loss is minimized.

- **Which of the following statements is true about fins?**

  - A) Fins always increase heat transfer efficiency.
  - B) The effectiveness of fins increases with increasing length.
  - C) Fins are used to decrease the surface area for heat transfer.
  - D) Fins operate under forced convection only.

  Answer: B) The effectiveness of fins increases with increasing length.

- **Free convection occurs when:**

- A) Fluid motion is induced by external means.
- B) Density differences cause fluid motion.
- C) Heat transfer is only by conduction.
- D) Heat is conducted through solids.

  Answer: B) Density differences cause fluid motion.

- **In forced convection, the heat transfer is primarily influenced by:**

  - A) Temperature difference alone
  - B) Fluid velocity
  - C) Surface area
  - D) Thermal conductivity

    Answer: B) Fluid velocity

- **When considering flow over flat plates, which parameter is critical for determining flow characteristics?**

  - A) Reynolds number
  - B) Mach number
  - C) Prandtl number
  - D) Nusselt number

    Answer: A) Reynolds number

- **For laminar flow in a circular pipe, the Nusselt number is given by:**

  - A) 4.36
  - B) 3.66
  - C) 0.664
  - D) 0.75

    Answer: A) 4.36

- **The Stefan-Boltzmann Law is used to describe:**

  - A) Conduction
  - B) Convection
  - C) Radiation

- D) Heat exchangers

  Answer: C) Radiation

- **A black body is defined as an object that:**

  - A) Reflects all radiation.
  - B) Absorbs all incident radiation.
  - C) Emits no radiation.
  - D) Has a constant temperature.

    Answer: B) Absorbs all incident radiation.

- **The emissivity of a grey body is:**

  - A) Always equal to 1
  - B) Less than 1
  - C) More than 1
  - D) Equal to the absorptivity

    Answer: B) Less than 1

- **Which of the following parameters affects the thermal resistance in conduction through a plane wall?**

  - A) Thickness of the wall
  - B) Temperature difference across the wall
  - C) Thermal conductivity of the wall
  - D) All of the above

    Answer: D) All of the above

- **What happens to the rate of heat transfer in a cylindrical system when insulation thickness increases beyond the critical thickness?**

  - A) Increases
  - B) Decreases
  - C) Remains constant
  - D) Becomes negative

    Answer: B) Decreases

- **In a heat exchanger, the overall heat transfer coefficient is affected by:**

  - A) Thermal conductivity of fluids
  - B) Surface area
  - C) Temperature difference
  - D) All of the above

    Answer: D) All of the above

- **The heat transfer coefficient is higher in which type of convection?**

  - A) Free convection
  - B) Forced convection
  - C) Both are equal
  - D) None of the above

    Answer: B) Forced convection

- **For a grey body, the fraction of incident radiation that is reflected is called:**

  - A) Absorptivity
  - B) Reflectivity
  - C) Transmissivity
  - D) Emissivity

    Answer: B) Reflectivity

- **In forced convection, the temperature gradient at the surface of the body is:**

  - A) Zero
  - B) High
  - C) Low
  - D) Constant

    Answer: B) High

- **In the context of thermal radiation, which of the following is true about a black body?**

  - A) It has a specific temperature range.
  - B) It emits radiation at all wavelengths.

- C) Its emissivity is less than that of a grey body.
- D) It reflects all incident radiation.

  Answer: B) It emits radiation at all wavelengths.

- **The thermal resistance for conduction in a cylinder is given by which formula?**

  - A) R=1kAR = \frac{1}{kA}R=kA1
  - B) R=LkAR = \frac{L}{kA}R=kAL
  - C) R=L2πkrR = \frac{L}{2\pi k r}R=2πkrL
  - D) R=Lk(2πr)R = \frac{L}{k(2\pi r)}R=k(2πr)L

  Answer: C) R=L2πkrR = \frac{L}{2\pi k r}R=2πkrL

- **In natural convection, the flow is driven by:**

  - A) Mechanical fans
  - B) Density changes due to heating
  - C) External pumps
  - D) None of the above

  Answer: B) Density changes due to heating

- **Which of the following factors does NOT influence the heat transfer rate through fins?**

  - A) Length of the fin
  - B) Thickness of the fin
  - C) Material of the fin
  - D) Color of the fin

  Answer: D) Color of the fin

- **The Rayleigh number is a dimensionless number used in fluid mechanics to characterize:**

  - A) Forced convection
  - B) Natural convection
  - C) Conduction

- D) Radiation

  Answer: B) Natural convection

- **In heat exchangers, the logarithmic mean temperature difference (LMTD) is used to:**

  - A) Calculate heat transfer efficiency
  - B) Determine the thermal resistance
  - C) Compare different configurations
  - D) None of the above

    Answer: A) Calculate heat transfer efficiency

- **Which of the following equations is used for the heat transfer in a laminar flow through a circular pipe?**

  - A) Nu=hDkNu = \frac{hD}{k}Nu=khD
  - B) Nu=0.3+0.4Re1/2Nu = 0.3 + \frac{0.4}{Re^{1/2}}Nu=0.3+Re1/20.4
  - C) Nu=3.66Nu = 3.66Nu=3.66
  - D) Nu=0.332Re1/2Pr1/3Nu = 0.332 Re^{1/2} Pr^{1/3}Nu=0.332Re1/2Pr1/3

    Answer: C) Nu=3.66Nu = 3.66Nu=3.66

- **For the same temperature difference, a grey body emits radiation at a rate that is:**

  - A) Equal to that of a black body
  - B) Less than that of a black body
  - C) More than that of a black body
  - D) Unpredictable

    Answer: B) Less than that of a black body