Assignment 12

Due on 2020-12-09, 23:59 IST.

As per our record, you have not submitted this assignment.

1) Consider the following statements

(a) The surface is favorable for nucleate boiling
(b) In a forced convection, the heat transfer coefficient is much less than in free convection
(c) The heat transfer coefficient is a minimum value at the start of boiling regime of a copper tube.

Choose the correct statements:

- Both 1 and 2 are correct
- Both 1 and 3 are correct
- Only 1 is correct
- Neither 1, 2, nor 3 are correct

No. The answer is incorrect.

2) For film condensation near vertical plates, the average heat transfer coefficient varies with taftral conductivity of the liquid following the relation:

\[ h_a \propto \frac{1}{\sqrt{\text{Pr}}} \]

\[ h_a \propto \frac{1}{\text{Pr}} \]

\[ h_a \propto \frac{1}{\text{Pr}^2} \]

\[ h_a \propto \frac{1}{\text{Pr}^3} \]

No. The answer is incorrect.

3) Consider the following statements

(a) Laminar heat transfer can be achieved with droplet condensation than to the film condensation
(b) Droplet condensation can be promoted by surface treatment
(c) In film condensation, the liquid film travels over the solid surface without losing heat transfer properties of the following statements are correct?

- Both 1 and 2 are correct
- Both 1 and 3 are correct
- Only 1 is correct
- Neither 1, 2, nor 3 are correct

No. The answer is incorrect.

4) For Rayleigh number (Ra) in the range 10^5 < Ra < 10^10, the flow regime in film condensation over the vertical plate is

- Laminar flow
- Turbulent flow
- Wavy laminar flow
- Stratified flow

No. The answer is incorrect.

5) For internal flow boiling, the flow regime in which bubble grow in size and coalescence into slugs of vapor is known as

- Bubbly flow
- Annular flow
- Slug flow
- Mux flow

No. The answer is incorrect.

6) The nucleate boiling is not influenced by surface characteristics

- True
- False

No. The answer is incorrect.

7) The bottom of a copper pan, 3.3 cm in diameter, is maintained at 110°C by an electric heater as shown in figure. The critical heat flux is ________ (KW/m²).

Assume steady state conditions, water is exposed to standard atmospheric pressure, 1.18 cm and at uniform temperature T_{\text{wall}} = 100°C. For bottom surface is polished copper and negligible from heater in surroundings. The properties of water at saturation temperature are, \(\rho = 998.2 \, \text{kg/m}^3\), \(\mu = 0.9 \times 10^{-3} \, \text{Pa s}\), \(\alpha = 2.0 \times 10^{-7} \, \text{m}^2/\text{s}\), and \(C_p = 4186 \, \text{J/kg} \cdot \text{K}\).

\[ h_{\text{crit}} = 120 \, \text{K/W/m}^2 \]

Electric heater

No. The answer is incorrect.

8) Submerged sphere at atmospheric pressure condenses on a 2 m high and 3 m wide vertical plate that is maintained at 90°C by circulating water through the other side as shown in figure. The ratio of heat transfer to convection to the plate is ________ .

Assume steady operating conditions, plate is horizontal, condensation flow is non-laminar over the entire plate, the density of vapor is much smaller than the density of the liquid. The properties of water at saturation temperature of 110°C are, \(\rho = 1293 \times 10^3 \, \text{kg/m}^3\), \(\mu = 3.0 \times 10^{-5} \, \text{Pa s}\), and \(C_p = 4186 \, \text{J/kg} \cdot \text{K}\). The temperature ratio for non-laminar flow over the entire plate is 1257. Do not round off or truncate any decimal value in intermediate calculations and provide solution with the places of decimals.

No. The answer is incorrect.

9) The answer is incorrect.

- (a)
- (b)

No. The answer is incorrect.