National Testing Agency

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Convective Heat Transfer Fundamentals and Applications

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Convective Heat Transfer Fundamentals and Applications

Section Id :	28860731
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Sub-Section Number:	1
Sub-Section Id:	28860731
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 2886072526 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

The significance of $\frac{\partial u}{\partial x}$ (u is the velocity in the x-direction) is as follows

(A) Rotation of the fluid element in the x direction

(B) Stretching or compression of the fluid element in the x-direction

(C) Angular deformation of the fluid element in the x direction

(D) Translation of the fluid element in the x direction

Options :

28860710094. 1

28860710095. 2

28860710096. 3

28860710097. 4

Question Number : 2 Question Id : 2886072527 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In a two dimensional irrotational, flow (*u* is the velocity in the *x*-direction and *v* is the velocity in the *y*-direction), the following relation is valid

(A) $\frac{\partial u}{\partial y} = \frac{\partial v}{\partial x}$

(B) $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$

(C) $\frac{\partial u}{\partial y} > -\frac{\partial v}{\partial x}$

(D) $\frac{\partial u}{\partial y} < -\frac{\partial v}{\partial x}$

Options :

28860710098. 1

28860710099. 2

28860710100. 3

28860710101. 4

Question Number : 3 Question Id : 2886072528 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Surface forces acting on the fluid element are caused by

(A) Normal stresses, shear stresses and pressure acting on the fluid element

(B) Gravity forces, normal stresses, shear stresses acting on the fluid element

(C) Shear stresses, Coriolis force, centrifugal force acting on the fluid element

(D) Gravity forces, Coriolis forces and centrifugal forces acting on the fluid element

Options :

28860710102. 1

28860710103. 2

28860710104. 3

28860710105. 4

Question Number : 4 Question Id : 2886072529 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In the derivation of relation between stress and rate of strain, the following assumptions are valid

(A) The stress components may be expressed as a linear function of the rates of strain components

(B) The relations between stress components and rates of strain components must be invariant to a coordinate transformation consisting of either a rotation or a mirror reflection of axes.

(C) The stress components must reduce to the hydrostatic pressure '*p*' when all the gradients of velocities are zero

(D) All of the above

Options :

28860710106. 1

28860710107. 2

28860710108. 3

28860710109. 4

Question Number : 5 Question Id : 2886072530 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For incompressible fluid flow involving heat transfer, without viscous dissipation, the following non-dimensional numbers are important

(A) Reynolds number, Prandtl number and Eckert number

(B) Reynolds number and Eckert number

(C) Prandtl number and Eckert number

(D) Reynolds number and Prandtl number

Options :

28860710110. 1

28860710111. 2

28860710112. 3

28860710113. 4

Question Number : 6 Question Id : 2886072531 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In the laminar layer of the three layer structure of the boundary layer, the following statement is true

(A) Laminar shear stress (τ_{lam}) >>> Turbulent shear stress (τ_{turb})

(B) Laminar shear stress τ_{lam} ~ Turbulent shear stress (τ_{turb})

(C) Laminar shear stress τ_{lam}<<<Turbulent shear stress (τ_{turb})

(D) None of the above

Options :

28860710114. 1

28860710115. 2

28860710116. 3

28860710117. 4

Question Number : 7 Question Id : 2886072532 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In the turbulent layer of the three layer structure of the boundary layer, the following statement is true

(A) Laminar shear stress (τ_{lam}) >>>Turbulent shear stress (τ_{turb})

(B) Laminar shear stress τ_{lam} ~ Turbulent shear stress (τ_{turb})

(C) Laminar shear stress τ_{lam}<<< Turbulent shear stress (τ_{turb})

(D) None of the above

Options :

28860710118. 1

28860710119. 2

28860710120. 3

28860710121. 4

Question Number : 8 Question Id : 2886072533 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

$\frac{1}{\sqrt{f}} = 2.0log\left(Re\sqrt{f}\right) - 0.8$ is applicable for

(A) Fully developed Laminar flow and hydraulically smooth pipe

(B) Fully developed Laminar flow and hydraulically rough pipe

(C) Fully developed Turbulent flow and hydraulically smooth pipe

(D) Fully developed Turbulent flow and hydraulically rough pipe

Options :

28860710122. 1

28860710123. 2

28860710124. 3

28860710125. 4

Question Number : 9 Question Id : 2886072534 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

The velocity profile for a fully developed turbulent flow in a circular pipe is as follows

(A) Parabolic distribution

(B) Power law distribution

(C) Linear distribution

(D) None of the above

Options :

28860710126. 1

28860710127. 2

28860710128. 3

28860710129. 4

Question Number : 10 Question Id : 2886072535 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In a hydraulically smooth pipe, the friction factor in a fully developed turbulent flow is a function of

(A) Reynolds number, geometrical roughness

(B) Reynolds number only

(C) Geometrical roughness only

(D) Independent of both Reynolds number and geometrical roughness

Options :

28860710130. 1

28860710131. 2

28860710132. 3

28860710133. 4

Question Number : 11 Question Id : 2886072536 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Time averaging the fluctuating component of the velocity in a turbulent flow is

(A) Zero

(B) One

(C) Infinity

(D) Same as the mean velocity

Options :

28860710134. 1

28860710135. 2

28860710136. 3

28860710137. 4

Question Number : 12 Question Id : 2886072537 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In a wind tunnel, there are contraction cones and screens of various mesh sizes. They essentially

(A) Increase turbulence intensity values
(B) No influence on the turbulence intensity
(C) Lessen turbulence intensity values
(D) None of the above

Options :

28860710138. 1

28860710139. 2

28860710140. 3

28860710141. 4

Question Number : 13 Question Id : 2886072538 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In external and internal flows, the solution of the mass and momentum equation fetches velocity distribution and pressure. Further, solution of energy equation fetches the temperature distribution. This information is used to calculate the following

(A) Thermal boundary layer thickness and Nusselt number
(B) Thermal boundary layer thickness alone
(C) Nusselt number alone
(D) None of the above

Options :

28860710142. 1

28860710143. 2

28860710144. 3

28860710145. 4

Question Number : 14 Question Id : 2886072539 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Natural convection occurs because of the presence of

(A) Density difference alone
(B) Density difference and gravity
(C) Gravity alone
(D) Density difference or gravity

Options :

28860710146. 1

28860710147. 2

28860710148. 3

28860710149. 4

Question Number : 15 Question Id : 2886072540 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider forced convection for either internal flow or external flows, which of the following statements are correct

P. Momentum equation and energy equation are uncoupled

Q. Momentum equation and energy equation are coupled

R. Velocity profile can be obtained from momentum equation and temperature profile can be obtained from energy equation

S. Velocity profile and temperature profile can be obtained by solving both the momentum and energy equation simultaneously

(A) P and S
(B) Q and R
(C) Q and S
(D) P and R

Options :

28860710150. 1

28860710151. 2

28860710152. 3

28860710153. 4

Question Number : 16 Question Id : 2886072541 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Natural convection dominates if

(A) Gr/Re^2 is very much less than one
(B) Gr/Re^2 is very much greater than one
(C) Gr/Re^2 is equal to one
(D) Gr/Re is equal to one

Options :

28860710154. 1

28860710155. 2

28860710156. 3

28860710157. 4

Question Number : 17 Question Id : 2886072542 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In general, in natural convection for external surfaces within the boundary layer, it is the balance of the following forces

(A) Inertia force and friction force
(B) Inertia force and Buoyancy force
(C) Friction force and buoyance force
(D) Inertia forces, Friction force and Buoyancy force

Options :

28860710158. 1

28860710159. 2

28860710160. 3

28860710161. 4

Question Number : 18 Question Id : 2886072543 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For low Prandtl number fluids, in natural convection for external surfaces within the thermal boundary layer, it is the balance of the following forces

(A) Inertia force and friction force
(B) Inertia force and buoyancy force
(C) Friction force and buoyancy force
(D) Inertia forces, Friction force and buoyancy force

Options :

28860710162. 1

28860710163. 2

28860710164. 3

28860710165. 4

Question Number : 19 Question Id : 2886072544 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at constant temperature surrounded by a high Prandtl number fluid, the scale of the thermal boundary layer is

(A) $HRa_H^{-\frac{1}{4}}$

(B) $HRa_H^{-\frac{1}{2}}$

(C) $HRa_H^{-\frac{1}{4}}Pr^{-\frac{1}{4}}$

(D) $HRa_H^{-\frac{1}{2}}Pr^{-\frac{1}{4}}$

where H is the height of the vertical plate and Ra_H is the Rayleigh number based on the height of the vertical plate

Options :

28860710166. 1

28860710167. 2

28860710168. 3

28860710169. 4

Question Number : 20 Question Id : 2886072545 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

. Consider natural convection around a vertical hot plate maintained at constant temperature surrounded by a low Prandtl number fluid, the scale of the Nusselt number is

(A) $Ra_H^{\frac{1}{4}}$

(B) $Ra_H^{\frac{1}{2}}$

(C) $Ra_H^{\frac{1}{4}}Pr^{\frac{1}{4}}$

(D) $Ra_H^{\frac{1}{2}}Pr^{\frac{1}{4}}$

where H is the height of the vertical plate and Ra_H is the Rayleigh number based on the height of the vertical plate

Options :

28860710170. 1

28860710171. 2

28860710172. 3

28860710173. 4

Question Number : 21 Question Id : 2886072546 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Which of the following statement is TRUE?

(A) filmwise condensation is preferred over dropwise condensation

(B) dropwise condensation is preferred over filmwise condensation

(C) dropwise condensation and filmwise condensation are equally good

(D) None of the above

Options :

28860710174. 1

28860710175. 2

28860710176. 3

28860710177. 4

Question Number : 22 Question Id : 2886072547 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In the Nusselt condensation, no temperature gradient is assumed in the vapour. In the background of this, which of the following statement is TRUE?

(A) Heat transfer to the liquid vapour interface can occur only by condensation at the interface and not by conduction from the vapour

(B) Heat transfer to the liquid vapour interface can occur not only by condensation at the interface but also by conduction from the vapour

(C) Heat transfer to the liquid vapour interface cannot occur by condensation at the interface, but occurs only by conduction from the vapour

(D) None of the above

Options :

28860710178. 1

28860710179. 2

28860710180. 3

28860710181. 4

Question Number : 23 Question Id : 2886072548 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For flow over a flat plate with no suction/blowing, constant u_∞ and $T_w > T_\infty$ for the case of $\Pr > 1$, the flow field is split into the following three regions:

Region I: $0 \leq y \leq \delta_t$

Region II: $\delta_t \leq y \leq \delta$

Region III: $y \geq \delta$

Which of the following is TRUE for Region II?

(A) $u(x,y) < u_\infty$ and $T(x,y) > T_\infty$

(B) $u(x,y) = u_\infty$ and $T(x,y) = T_\infty$

(C) $u(x,y) < u_\infty$ and $T(x,y) = T_\infty$

(D) $u(x,y) = u_\infty$ and $T(x,y) > T_\infty$

Options :

28860710182. 1

28860710183. 2

28860710184. 3

28860710185. 4

Question Number : 24 Question Id : 2886072549 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction/blowing, constant u_∞ and $T_w > T_\infty$ for the case of $Pr < 1$, the flow field is split into the following three regions:

Region I: $0 \leq y \leq \delta$

Region II: $\delta \leq y \leq \delta_t$

Region III: $y \geq \delta_t$

Which of the following is TRUE for Region II?

(A) $u(x,y) < u_\infty$ and $T(x,y) > T_\infty$

(B) $u(x,y) = u_\infty$ and $T(x,y) = T_\infty$

(C) $u(x,y) = u_\infty$ and $T(x,y) > T_\infty$

(D) $u(x,y) < u_\infty$ and $T(x,y) = T_\infty$

Options :

28860710186. 1

28860710187. 2

28860710188. 3

28860710189. 4

Question Number : 25 Question Id : 2886072550 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction or blowing, constant u_∞, if the velocity profile is $\frac{u}{u_\infty} = AsinBy + C$; the values of A, B and C are respectively:

(A) 1, $\frac{\pi}{2\delta}$, 1

(B) 1, $\frac{\pi}{2}$, 1

(C) -1, $\frac{\pi}{2\delta}$, 0

(D) 1, $\frac{\pi}{2\delta}$, 0

Options :

28860710190. 1

28860710191. 2

28860710192. 3

28860710193. 4

Question Number : 26 Question Id : 2886072551 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction or blowing, constant u_∞, if the velocity profile is $\frac{u}{u_\infty} = sin\left(\frac{\pi y}{2\delta}\right)$; displacement thickness is:

(A) $\left(\frac{\pi+2}{\pi}\right)\delta$

(B) $\left(\frac{\pi-2}{\pi}\right)\delta$

(C) $\frac{2}{3}$

(D) $\frac{1}{3}$

Options :

28860710194. 1

28860710195. 2

28860710196. 3

28860710197. 4

Question Number : 27 Question Id : 2886072552 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction or blowing, constant u_∞, if the velocity profile is $\frac{u}{u_\infty} = sin\left(\frac{\pi y}{2\delta}\right)$, the momentum thickness δ_2 is:

(A) $\left(\frac{1}{2}\right)\delta$

(B) $\left(\frac{2}{\pi}\right)\delta$

(C) $\left(\frac{4+\pi}{2\pi}\right)\delta$

(D) $\left(\frac{4-\pi}{2\pi}\right)\delta$

Options :

28860710198. 1

28860710199. 2

28860710200. 3

28860710201. 4

Question Number : 28 Question Id : 2886072553 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For the velocity profile $\frac{u}{u_\infty} = 2\eta - \eta^2$ where, $\left[\eta = \frac{y}{\delta(x)}\right]$; the wall shear stress is:

(A) $\frac{2\mu\, u_\infty}{\delta}$
(B) $\frac{\mu u_\infty}{\delta}$
(C) 0
(D) $\frac{2\mu\, u_\infty}{3\delta}$

Options :

28860710202. 1

28860710203. 2

28860710204. 3

28860710205. 4

Question Number : 29 Question Id : 2886072554 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For flow over a flat plate, the flow velocity is increased by a factor of 4, keeping all other variables constant in case of a laminar flow, the boundary layer thickness ________________

(A) increases by a factor of 4
(B) increases by a factor of 2
(C) decreases by a factor of 2
(D) decreases by a factor of 4

Options :

28860710206. 1

28860710207. 2

28860710208. 3

28860710209. 4

Question Number : 30 Question Id : 2886072555 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

An incompressible fluid flows between two infinite stationary parallel plates. The velocity profile is given by $u(y) = U_{max}\left[1 - \left(\frac{2y}{h}\right)^2\right]$, The y coordinate is measured from the centre of the gap. The average (bulk mean) velocity is given equal to

(A) $0.5U_{max}$
(B) $\frac{U_{max}}{3}$
(C) $\frac{2U_{max}}{3}$
(D) $\frac{3U_{max}}{4}$

Options :

28860710210. 1

28860710211. 2

28860710212. 3

28860710213. 4

Question Number : 31 Question Id : 2886072556 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For flow over a flat plate, the free stream velocity is increased by a factor of 4, keeping all other variables constant. If fluid has $Pr \ll 1$, which of the following is TRUE?

(A) δ and δ_t both decrease
(B) δ and δ_t both increase
(C) δ decreases and δ_t remains unchanged
(D) δ remains unchanged and δ_t decreases

Options :

28860710214. 1

28860710215. 2

28860710216. 3

28860710217. 4

Question Number : 32 Question Id : 2886072557 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In case of fully developed flow through pipes, the heat transfer coefficient

(A) Increases continuously
(B) Decreases continuously
(C) Oscillates about a mean value
(D) Remains constant

Options :

28860710218. 1

28860710219. 2

28860710220. 3

28860710221. 4

Question Number : 33 Question Id : 2886072558 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In the fully developed region, for flow through a circular pipe with constant wall temperature, the driving temperature difference, $\Delta T = T_{wall} - T_m(z)$, ______ along the flow direction

(A) increases exponentially
(B) decreases exponentially
(C) remains constant
(D) decreases linearly

Options :

28860710222. 1

28860710223. 2

28860710224. 3

28860710225. 4

Question Number : 34 Question Id : 2886072559 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

The following statements are related to laminar and turbulent flows:

1. Wall shear stress for laminar flow is lower than that for turbulent flow
2. Heat transfer coefficient for turbulent flow is lower than that for laminar flow

Which of the following combination are acceptable?

(A) Both 1 and 2 are false
(B) Both 1 and 2 are True
(C) Statement 2 is true and Statement 1 is false
(D) Statement 1 is true and Statement 2 is false.

Options :

28860710226. 1

28860710227. 2

28860710228. 3

28860710229. 4

Question Number : 35 Question Id : 2886072560 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For flow of oil over a flat plate,

(A) The thermal boundary layer and velocity boundary layer are of the same thickness at any axial location.

(B) The thermal boundary layer is always thicker than the velocity boundary layer at any axial location.

(C) The thermal boundary layer is always thinner than the velocity boundary layer at any axial location.

(D) Thermal boundary layer thickness is constant in the laminar region and then increases.

Options :

28860710230. 1

28860710231. 2

28860710232. 3

28860710233. 4

Question Number : 36 Question Id : 2886072561 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For flow of liquid metal over a flat plate,

(A) The thermal boundary layer and velocity boundary layer are of the same thickness at any axial location.

(B) The thermal boundary layer is always thicker than the velocity boundary layer at any axial location.

(C) The thermal boundary layer is always thinner than the velocity boundary layer at any axial location.

(D) Thermal boundary layer thickness is constant in the laminar region and then increases.

Options :

28860710234. 1

28860710235. 2

28860710236. 3

28860710237. 4

Question Number : 37 Question Id : 2886072562 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Adiabatic temperature and bulk mean (mixing cup) temperature are equal when

(A) No upstream heat sources are powered on

(B) No downstream heat sources are powered on

(C) Only when single heat source is present in the system

(D) All the heat sources BUT the given heat source are powered off.

Options :

28860710238. 1

28860710239. 2

28860710240. 3

28860710241. 4

Question Number : 38 Question Id : 2886072563 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For fixed mass flow rate to a heat sink with a specified maximum pressure drop and maximum base plate temperature:

(A) Increasing surface area always improves heat dissipation
(B) Increase in the surface area helps only as long as sensible heat carried away is not limiting
(C) Cannot say
(D) None of the above

Options :

28860710242. 1

28860710243. 2

28860710244. 3

28860710245. 4

Question Number : 39 Question Id : 2886072564 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For non-conforming rough solids in contact in vacuum and negligible radiation contribution (and no interstitial substance), the joint resistance is

(A) $Rjoint = Rmicrospot + Rmacrospot$
(B) $1/Rjoint = 1/Rmicro - spot + 1/Rmacro - spot$
(C) Cannot be defined
(D) None of the above

Options :

28860710246. 1

28860710247. 2

28860710248. 3

28860710249. 4

Question Number : 40 Question Id : 2886072565 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Contact resistance between bare metal surfaces increases when

(A) Large warpage exists

(B) Loading pressure is low or negligible

(C) Extremely smooth surfaces are in contact

(D) All the above

Options :

28860710250. 1

28860710251. 2

28860710252. 3

28860710253. 4

Question Number : 41 Question Id : 2886072566 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Which set of statements is TRUE?

(A) DNB occurs at high quality and Dryout occurs at low quality

(B) Decrease in heat transfer coefficient is very severe for dryout when compared to DNB.

(C) DNB can be predicted easily in an experiment

(D) DNB occurs at low quality and dryout occurs at high quality

Options :

28860710254. 1

28860710255. 2

28860710256. 3

28860710257. 4

Question Number : 42 Question Id : 2886072567 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For a circular pipe whose diameter increases linearly along the flow direction, for a given mass flow rate and constant properties, the Reynolds number of flow_______ along the flow direction. (Assume no flow separation)

(A) Decreases

(B) Remains constant

(C) Increases

(D) Increases in the developing region and then remains constant

Options :

28860710258. 1

28860710259. 2

28860710260. 3

28860710261. 4

Question Number : 43 Question Id : 2886072568 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For a circular pipe whose diameter increases linearly along the flow direction, for a given mass flow rate and constant properties, the maximum velocity of flow_______ along the flow direction. (Assume no flow separation)

(A) Remains constant
(B) increases
(C) decreases
(D) Decreases in the developing region and then remains constant

Options :

28860710262. 1

28860710263. 2

28860710264. 3

28860710265. 4

Question Number : 44 Question Id : 2886072569 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Radiation heat transfer plays a significant role in

(A) Film boiling region
(B) Subcooled nucleate boiling region
(C) Saturated nucleate boiling region
(D) Single phase natural convection

Options :

28860710266. 1

28860710267. 2

28860710268. 3

28860710269. 4

Question Number : 45 Question Id : 2886072570 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Transition boiling regime will be seen in

(A) Heat flux controlled pool boiling experiments
(B) Wall temperature controlled pool boiling experiments
(C) Pool boiling experiments conducted under very controlled conditions
(D) Micro and nanoscale experiments

Options :

28860710270. 1

28860710271. 2

28860710272. 3

28860710273. 4

Question Number : 46 Question Id : 2886072571 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

The correct sequence of heat transfer processes that occur when heat flux is gradually increased in a pool boiling experiment is

(A) Single phase natural convection, subcooled nucleate boiling, CHF, saturated nucleate boiling

(B) Subcooled nucleated boiling, saturated nucleate boiling, CHF, single phase natural convection

(C) single phase natural convection, subcooled nucleate boiling, saturated nucleate boiling, CHF

(D) CHF, saturated nucleate boiling, subcooled nucleate boiling, single phase natural convection

Options :

28860710274. 1

28860710275. 2

28860710276. 3

28860710277. 4

Question Number : 47 Question Id : 2886072572 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

An incompressible fluid flows between two infinite stationary parallel plates. The velocity profile is given by $u(y) = U_{max}(Ay^2 + By + C)$, where *A, B and C* are constants that need to be determined. The *y* coordinate is measured from the centre of the gap. The boundary conditions that are relevant to the problem are given below. One of them is incorrect, identify the WRONG boundary condition.

(A) $At\ y = 0, u = U_{max}$

(B) $At\ y = 0, u = 0$

(C) $At\ y = \frac{h}{2}, u = 0$

(D) $At\ y = -\frac{h}{2}, u = 0$

Options :

28860710278. 1

28860710279. 2

28860710280. 3

28860710281. 4

Question Number : 48 Question Id : 2886072573 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Which of the following statement is TRUE with regard to the Overall Heat Transfer Coefficient, *U*?

(A) For a given geometry and application, *U* is a constant

(B) The overall heat transfer coefficient is equal to the sum of the thermal resistances in the circuit

(C) It represents the heat transfer coefficient based on the arithmetic temperature difference, not LMTD.

(D) For a given geometry and application, the product *UA* is a constant

Options :

28860710282. 1

28860710283. 2

28860710284. 3

28860710285. 4

Question Number : 49 Question Id : 2886072574 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In saturated nucleate boiling, the total heat transfer coefficient is a result of

(A) Nucleation and natural convection

(B) Natural convection and forced convection

(C) Radiation, forced convection and natural convection

(D) Nucleation and forced convection

Options :

28860710286. 1

28860710287. 2

28860710288. 3

28860710289. 4

Question Number : 50 Question Id : 2886072575 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In case of $U_\infty = Cx^m$, defined in Similarity method, 'm' is called as:

(A) pressure gradient parameter

(B) suction or blowing parameter

(C) viscous dissipation parameter

(D) friction parameter

Options :

28860710290. 1

28860710291. 2

28860710292. 3

28860710293. 4

Question Number : 51 Question Id : 2886072576 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Void fraction in two phase flow is defined as the ratio of

(A) Volume occupied by the gas phase to that occupied by the liquid phase
(B) Volume occupied by the liquid phase to that occupied by the gas phase
(C) Volume occupied by the liquid phase to the total volume
(D) Volume occupied by the gas phase to the total volume

Options :

28860710294. 1

28860710295. 2

28860710296. 3

28860710297. 4

Question Number : 52 Question Id : 2886072577 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In the Falkner Skan solution by similarity method, the wedge central angle was given by $\pi\beta$. Match the columns appropriately:

Value of β	Flow Situation
P. $\beta = 0$	1. Stagnation point flow
Q. $\beta = 1$	2. flow separation
R. $\beta = -0.2$	3. flow over a flat plate
	4. flow over a backward facing plate

(A) P-3, Q-1, R-4
(B) P-3, Q-1, R-2
(C) P-3, Q-2, R-1
(D) P-2, Q-3, R-1

Options :

28860710298. 1

28860710299. 2

28860710300. 3

28860710301. 4

Question Number : 53 Question Id : 2886072578 Question Type : MCQ Option Shuffling : No

Correct Marks : 1 Wrong Marks : 0

In similarity analysis, the similarity variable was defined as $\eta = y\sqrt{\frac{U_\infty}{\nu x}}$. For the flow of the same fluid over a flat plate, consider the following cases:

Case P	Case Q
$\eta = 3.45$ $U_\infty = U_{\infty,1}$ $y = y_1$ $x = x_1$	$\eta = 3.45$ $U_\infty = U_{\infty,2}$ $y = y_2$ $x = x_2$

The value of $\frac{x_2}{x_1}$, if $U_{\infty,2} = 4 \times U_{\infty,1}$ is

(A) 2
(B) 0.5
(C) 0.25
(D) 4

Options :

28860710302. 1

28860710303. 2

28860710304. 3

28860710305. 4

Question Number : 54 Question Id : 2886072579 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

A concentric multi cylinder geometry comprising of two circular pipes and insulation on the outside has the combined thermal resistances to be 0.001 K/W. The outermost surface is 0.1 m^2, while the innermost surface area is 0.025 m^2. The product *UA* (in W/K), based on the *innermost* surface area would be

(A) 10000
(B) 40000
(C) 1000
(D) 250

Options :

28860710306. 1

28860710307. 2

28860710308. 3

28860710309. 4

Question Number : 55 Question Id : 2886072580 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

A concentric multi cylinder geometry comprising of two circular pipes and insulation on the outside has the overall heat transfer coefficient to be 1920 W/m^2K based on the innermost area. The outermost diameter is twice the innermost diameter. The overall heat transfer coefficient, in W/m^2K, based on the outermost area would be

(A) 960
(B) 3840
(C) 1920
(D) 480

Options :

28860710310. 1

28860710311. 2

28860710312. 3

28860710313. 4

Question Number : 56 Question Id : 2886072581 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

An experiment revealed that $\overline{Nu}_L = CRe_L^{0.5}Pr^n$. If the velocity of the flow is increased by a factor of 4, the ratio of the new Nusselt number to the original value is

(A) 2
(B) 0.25
(C) 4
(D) 0.5

Options :

28860710314. 1

28860710315. 2

28860710316. 3

28860710317. 4

Question Number : 57 Question Id : 2886072582 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Experimental investigations were carried out for flow of air over a heated cylinder of square cross section. The cylinder is oriented such that the diagonal of length 0.5 m is parallel to the flow direction. The average heat transfer coefficient is 50 W/m^2K and 40 W/m^2K when the free stream velocities are 20 m/s and 15 m/s respectively. Assume the Nusselt number is correlated as $\overline{Nu}_L = Re_L^m Pr^n$, where *C*, *m* and *n* are positive known constants. The value of the index '*m*' is

(A) 0.9375
(B) 0.775
(C) 1.289
(D) 1.066

Options :

28860710318. 1

28860710319. 2

28860710320. 3

28860710321. 4

Question Number : 58 Question Id : 2886072583 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

From the group of characteristics listed below, choose all that apply to Dryout

I. High quality
II. Low quality
III. Low heat flux
IV. High heat flux
V. Very severe reduction in heat transfer coefficient
VI. Not so severe reduction in heat transfer coefficient

(A) I, IV, VI
(B) I, III, VI
(C) I, III, V
(D) II, III, VI

Options :

28860710322. 1

28860710323. 2

28860710324. 3

28860710325. 4

Question Number : 59 Question Id : 2886072584 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

. List of processes and important points that occur in a boiling curve are given below.

P-Single phase Natural convection
Q- Saturated nucleate boiling
R-CHF
S-Transition boiling
T-Leidenfrost point
V-Film boiling

Which of the following represents correct sequence of processes that occur in a boiling curve for wall temperature controlled case with progressively *decreasing* wall temperature?

(A) V-Q-T-P
(B) V-S-T-Q-P
(C) V-T-S-R-Q-P
(D) V-Q-R-P

Options :

28860710326. 1

28860710327. 2

28860710328. 3

28860710329. 4

Question Number : 60 Question Id : 2886072585 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

List of processes and important points that occur in a boiling curve are given below.

P-Single phase Natural convection
Q- Saturated nucleate boiling
R-CHF
S-Transition boiling
T-Leidenfrost point
V-Film boiling

Which of the following represents correct sequence of processes that occur in a boiling curve for heat flux controlled case with progressively *increasing* heat flux?

(A) P-Q-R-S-V-T
(B) P-Q-R-S
(C) P-Q-R-V
(D) P-Q-T-V

Options :

28860710330. 1

28860710331. 2

28860710332. 3

28860710333. 4

Question Number : 61 Question Id : 2886072586 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

For heat pipe to operate in an effective manner

(A) heat transfer rates of evaporator and condenser should be same

(B) temperature difference between condenser and evaporator should be high enough to overcome pressure drop

(C) evaporator saturation temperature should be low

(D) none of the above

Options :

28860710334. 1

28860710335. 2

28860710336. 3

28860710337. 4

Question Number : 62 Question Id : 2886072587 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

A heat sink with chimney performs better than a heat sink without it under optimal conditions. Chimney improves heat sink performance because it:

(A) increases surface area

(B) reduces obstruction to flow

(C) heat transfer augmentation

(D) increases free convective velocities

Options :

28860710338. 1

28860710339. 2

28860710340. 3

28860710341. 4

Question Number : 63 Question Id : 2886072588 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Match the following (use your best judgement)

Heat Flux W/m^2, ($T_{junction} - T_{ambient}$) °C	Dominant Heat Transfer Mode(s)
P. 150, 12 Q. 120000, 40 R. 140000, 2	(i)Forced convection (ii) Liquid gas phase change (iii) Natural convection, radiation

(A) P-iii, Q-i, R-ii
(B) P-ii, Q-iii, R-i
(C) P-iii, Q-ii, R-i
(D) P-i, Q-iii, R-ii

Options :

28860710342. 1

28860710343. 2

28860710344. 3

28860710345. 4

Question Number : 64 Question Id : 2886072589 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider a paraffin wax cuboid of 1 cm each. Cuboid of wax is at melting point 35 °C, initially. Density, latent heat of melting and thermal conductivity of wax is specified as 800 kg/m^3, 250 kJ/kg and 0.23 W/mK, respectively. Assuming negligible sensible heating and overall heat input to the domain as 10 W, the total time for melting, is

(A) 2000 s,
(B) 1500 s,
(C) 2500 hours,
(D) 2000 minutes

Options :

28860710346. 1

28860710347. 2

28860710348. 3

28860710349. 4

Question Number : 65 Question Id : 2886072590 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Solid-liquid phase change problems have which of the following characteristics:

P. They are transient problems

Q. They are characterised by moving boundaries

R. The interface locations in these problems are not known in advance

(A) P and Q only
(B) Q and R only
(C) P and R only
(D) P, Q and R.

Options :

28860710350. 1

28860710351. 2

28860710352. 3

28860710353. 4

Question Number : 66 Question Id : 2886072591 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Which of the following may be considered as a high Prandtl number fluid?

(A) Liquid Metals
(B) Gases
(C) Glycerine
(D) water

Options :

28860710354. 1

28860710355. 2

28860710356. 3

28860710357. 4

Question Number : 67 Question Id : 2886072592 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at constant temperature surrounded by a low Prandtl number fluid, the scale of the vertical velocity is

(A) $\frac{\alpha}{H} Ra_H^{\frac{1}{4}}$

(B) $\frac{\alpha}{H} Ra_H^{\frac{1}{2}}$

(C) $\frac{\alpha}{H} Ra_H^{\frac{1}{4}} Pr^{\frac{1}{4}}$

(D) $\frac{\alpha}{H} Ra_H^{\frac{1}{2}} Pr^{\frac{1}{2}}$

where H is the height of the vertical plate and Ra_H is the Rayleigh number based on the height of the vertical plate

Options :

28860710358. 1

28860710359. 2

28860710360. 3

28860710361. 4

Question Number : 68 Question Id : 2886072593 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

In forced convection, the velocity profile is described by

(A) Thermal boundary layer thickness (δ_T)

(B) Hydrodynamic boundary layer thickness (δ)

(C) Both thermal and hydrodynamic boundary layer thickness (δ_T and δ)

(D) Neither thermal or hydrodynamic boundary layer thickness (δ_T and δ)

Options :

28860710362. 1

28860710363. 2

28860710364. 3

28860710365. 4

Question Number : 69 Question Id : 2886072594 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at constant temperature surrounded by a high Prandtl number fluid, the thickness of the wall jet is

(A) $Pr^{-\frac{1}{4}}\left(HRa_H^{-\frac{1}{2}}\right)$

(B) $Pr^{-\frac{1}{2}}\left(HRa_H^{-\frac{1}{4}}\right)$

(C) $Pr^{\frac{1}{2}}\left(HRa_H^{-\frac{1}{4}}\right)$

(D) $Pr^{\frac{1}{4}}\left(HRa_H^{-\frac{1}{4}}\right)$

where H is the height of the vertical plate and Ra_H is the Rayleigh number based on the height of the vertical plate

Options :

28860710366. 1

28860710367. 2

28860710368. 3

28860710369. 4

Question Number : 70 Question Id : 2886072595 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at constant temperature surrounded by a low Prandtl number fluid, the distance from the wall to the velocity peak is

(A) $\left(HRa_H^{-\frac{1}{2}}\right)$

(B) $Pr^{-\frac{1}{2}}\left(HRa_H^{-\frac{1}{4}}\right)$

(C) $\left(HRa_H^{-\frac{1}{4}}\right)$

(D) $Pr^{\frac{1}{4}}\left(HRa_H^{-\frac{1}{4}}\right)$

where H is the height of the vertical plate and Ra_H is the Rayleigh number based on the height of the vertical plate

Options :

28860710370. 1

28860710371. 2

28860710372. 3

28860710373. 4

Question Number : 71 Question Id : 2886072596 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Rayleigh number is defined as

(A) $\frac{g\beta(T_s - T_\infty)H^3}{\nu^2}$

(B) $\frac{g\beta(T - T_\infty)H^3}{\alpha\nu}$

(C) $\frac{u_\infty H(T_s - T_\infty)}{\nu\alpha}$

(D) $\frac{\nu g\beta(T - T_\infty)H^3}{\alpha}$

Options :

28860710374. 1

28860710375. 2

28860710376. 3

28860710377. 4

Question Number : 72 Question Id : 2886072597 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at constant heat flux surrounded by a high Prandtl number fluid, the thermal boundary layer thickness is

(A) $H\left(\frac{g\beta q'' H^4}{\alpha\nu k}\right)^{-\frac{1}{5}}$

(B) $H\left(\frac{g\beta \Delta T H^3}{\alpha\nu}\right)^{-\frac{1}{4}}$

(C) $H\left(\frac{g\beta q'' H^4}{\alpha\nu k}\right)^{-\frac{1}{4}}$

(D) $H\left(\frac{g\beta \Delta T H^3}{\alpha\nu k}\right)^{-\frac{1}{5}}$

Options :

28860710378. 1

28860710379. 2

28860710380. 3

28860710381. 4

Question Number : 73 Question Id : 2886072598 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at constant heat flux surrounded by a low Prandtl number fluid, the Nusselt number is

(A) $\left(\frac{g\beta q''H^4}{\alpha^2 k}\right)^{\frac{1}{5}}$

(B) $\left(\frac{g\beta \Delta T H^3}{\alpha \nu}\right)^{\frac{1}{4}}$

(C) $\left(\frac{g\beta q''H^4}{\alpha \nu k}\right)^{\frac{1}{4}}$

(D) $\left(\frac{g\beta \Delta T H^3}{\alpha^2 k}\right)^{\frac{1}{5}}$

Options :

28860710382. 1

28860710383. 2

28860710384. 3

28860710385. 4

Question Number : 74 Question Id : 2886072599 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

The critical Reynolds number in internal flows is

(A) 2300
(B) 5×10^5
(C) 10000
(D) 300

Options :

28860710386. 1

28860710387. 2

28860710388. 3

28860710389. 4

Question Number : 75 Question Id : 2886072600 Question Type : MCQ Option Shuffling : No
Correct Marks : 1 Wrong Marks : 0

Eddy momentum diffusivity is a

(A) Fluid property
(B) Flow parameter
(C) Both fluid property and flow parameter
(D) Neither fluid property nor flow parameter

Options :

28860710390. 1

28860710391. 2

28860710392. 3

28860710393. 4