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National Testing Agency

Question Paper Name :	Convective Heat Transfer Fundamenta 2020 Shift 1
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Convective Heat Transfer Fundamentals and Applications

Group Number :	1
Group Id :	8995146
Group Maximum Duration :	0
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Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	75
Is this Group for Examiner? :	No

Convective Heat Transfer Fundamentals and Applications

Section Id :	8995146
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	75
Number of Questions to be attempted :	75
Section Marks :	75
Display Number Panel :	Yes
Group All Questions :	Yes
Mark As Answered Required? :	Yes

Sub-Section Number : 1
Sub-Section Id : 8995146
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 899514441 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

General motion of a fluid particle consists of the following
(A) Translation only
(B) Linear deformation only
(C) Rotation only
(D) Translation, linear deformation, rotation and angular deformatio

Options :
8995141761. 1
8995141762. 2
8995141763. 3
8995141764. 4

Question Number : 2 Question Id : 899514442 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Cross derivatives like $\frac{\partial u}{\partial y}, \frac{\partial v}{\partial x}$ (u is the velocity in the x-direction and v is t the y-direction) cause the fluid element to
(A) Undergo linear deformation
(B) Undergo Translation
(C) Rotate and undergo angular deformation
(D) Linear deformation and translation

Options :

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8995141765. 1
8995141766. 2
8995141767. 3
8995141768. 4

Question Number : 3 Question Id : 899514443 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For an incompressible steady flow, the continuity equation is given by

(A) $\left[\frac{\partial \rho}{\partial t} + u\frac{\partial \rho}{\partial x} + v\frac{\partial \rho}{\partial y} + w\frac{\partial \rho}{\partial z}\right] + \rho\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z}\right) = 0$

(B) $\left[\frac{\partial \rho}{\partial t} + u\frac{\partial \rho}{\partial x} + v\frac{\partial \rho}{\partial y} + w\frac{\partial \rho}{\partial z}\right] = 0$

(C) $\left[u\frac{\partial \rho}{\partial x} + v\frac{\partial \rho}{\partial y} + w\frac{\partial \rho}{\partial z}\right] = 0$

(D) $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$

Options :
8995141769. 1
8995141770. 2
8995141771. 3
8995141772. 4

Question Number : 4 Question Id : 899514444 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Body forces acting on the fluid element are caused by

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

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

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

(D) Gravity forces, Coriolis forces and centrifugal forces acting on t

Options :
8995141773. 1
8995141774. 2
8995141775. 3
8995141776. 4

Question Number : 5 Question Id : 899514445 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Non-dimensionalisation of the energy equation results in the following numbers

(A) Reynolds number, Prandtl number and Eckert number

(B) Reynolds number and Prandtl number

(C) Reynolds number and Eckert number

(D) Prandtl number and Eckert number

Options :
8995141777. 1
8995141778. 2
8995141779. 3
8995141780. 4

Question Number : 6 Question Id : 899514446 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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For high speed supersonic flows (high Mach number flows), the followin
dimensional numbers are important

(A) Reynolds number, Prandtl number and Eckert number
(B) Reynolds number and Prandtl number
(C) Reynolds number and Eckert number
(D) Prandtl number and Eckert number

Options :
8995141781. 1
8995141782. 2
8995141783. 3
8995141784. 4

Question Number : 7 Question Id : 899514447 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

In the buffer layer (overlap layer) of the three layer structure of the bo
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 :
8995141785. 1
8995141786. 2
8995141787. 3
8995141788. 4

Question Number : 8 Question Id : 899514448 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I

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Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

$\frac{1}{\sqrt{f}} = 2.0log\left(Re\sqrt{f}\right) - 0.8$ is derived on the basis of

(A) Universal velocity distribution and drawing constants from expe

(B) Purely experimental results (empirical approach)

(C) Purely on the basis of universal velocity distribution

(D) None of the above

Options :
8995141789. 1
8995141790. 2
8995141791. 3
8995141792. 4

Question Number : 9 Question Id : 899514449 Question Type : MCQ Option Shuffling : No Display Question Number : Yes I
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

$\frac{1}{\sqrt{f}} = 2.0log\left(\frac{\frac{\varepsilon}{D}}{3.7}\right)$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 :
8995141793. 1
8995141794. 2
8995141795. 3
8995141796. 4

Question Number : 10 Question Id : 899514450 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A pipe is said to be hydraulically rough pipe, if the following co satisfied

(A) Roughness elements are geometrically small enough that they c viscous sublayer

(B) It is the geometrical roughness which matters, but not the v thickness

(C) Roughness elements are geometrically large enough, they br sublayer

(D) None of the above

Options :

8995141797. 1

8995141798. 2

8995141799. 3

8995141800. 4

Question Number : 11 Question Id : 899514451 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In a hydraulically rough pipe, the friction factor in a fully developed tu
function of

(A) Reynolds number and geometrical roughness
(B) Reynolds number only
(C) Geometrical roughness only
(D) Independent of both Reynolds number and geometrical roughnes

Options :
8995141801. 1
8995141802. 2
8995141803. 3
8995141804. 4

Question Number : 12 Question Id : 899514452 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

The fluctuating component of the velocity in a turbulent flow is measured

(A) Pitot tube and manometer
(B) Hot wire anemometer
(C) Pitot tube alone
(D) None of the above

Options :
8995141805. 1
8995141806. 2
8995141807. 3
8995141808. 4

Question Number : 13 Question Id : 899514453 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical

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Correct Marks : 1 Wrong Marks : 0

In external and internal flows, the solution of the mass and momentum ec
velocity distribution and pressure. This information is used to calculate t

(A) Hydrodynamic boundary layer thickness and skin friction coeffic
(B) Hydrodynamic boundary layer thickness alone
(C) Skin friction coefficient alone
(D) None of the above

Options :
8995141809. 1
8995141810. 2
8995141811. 3
8995141812. 4

Question Number : 14 Question Id : 899514454 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Consider flow over a flat plate with a Reynolds number of 10000
maintained at constant wall temperature, the essential condition for sati
analogy is as follows

(A) Prandtl number is to be lower than unity
(B) Prandtl number is to be greater than unity
(C) Prandtl number is required to be unity
(D) None of the above

Options :
8995141813. 1
8995141814. 2
8995141815. 3
8995141816. 4

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Question Number : 15 Question Id : 899514455 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Consider a vertical hot body immersed in a quiescent cold fluid in which steady and natural convection is laminar. Non-dimensionalisation of the equation results in the following non-dimensional numbers

(A) Grashoff number and Reynolds number
(B) Grashoff number, Reynolds number and Prandtl number
(C) Reynolds number and Prandtl number
(D) Reynolds number, Grashoff number and Eckert number

Options :
8995141817. 1
8995141818. 2
8995141819. 3
8995141820. 4

Question Number : 16 Question Id : 899514456 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Consider natural convection for either internal flow or external flow
following statement is correct

(A) Momentum equation and energy equation are uncoupled

(B) Momentum equation and energy equation are coupled

(C) Velocity profile can be obtained from momentum equation and te
profile can be obtained from energy equation

(D) Velocity profile and temperature profile can be obtained by solvi
equation

Options :
8995141821. 1
8995141822. 2
8995141823. 3
8995141824. 4

Question Number : 17 Question Id : 899514457 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Consider natural convection for vertical hot plates, the critical Grashoff n

(A) Around 2×10^5

(B) Around 2300

(C) Around 100

(D) Around 10^9

Options :
8995141825. 1
8995141826. 2
8995141827. 3
8995141828. 4

Question Number : 18 Question Id : 899514458 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For high Prandtl number fluids, in natural convection for external sur 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 :
8995141829. 1
8995141830. 2
8995141831. 3
8995141832. 4

Question Number : 19 Question Id : 899514459 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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Consider natural convection around a vertical hot plate maintai[n]
temperature surrounded by a low Prandtl number fluid, the scale of the t[h]
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 n[umber based on]
the height of the vertical plate

Options :
8995141833. 1
8995141834. 2
8995141835. 3
8995141836. 4

Question Number : 20 Question Id : 899514460 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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Consider natural convection around a vertical hot plate maintain
temperature surrounded by a high Prandtl number fluid, the scale of the
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 n
the height of the vertical plate

Options :
8995141837. 1
8995141838. 2
8995141839. 3
8995141840. 4

Question Number : 21 Question Id : 899514461 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Which of the following statement is TRUE?

(A) a radiation analysis should normally accompany a natural con
unless the emissivity of the surface is low

(B) a radiation analysis should normally accompany a natural con
unless the emissivity of the surface is high

(C) radiation analysis may be neglected during natural conv
irrespective of the emissivity of the surface

(D) None of the above

Options :
8995141841. 1
8995141842. 2
8995141843. 3
8995141844. 4

Question Number : 22 Question Id : 899514462 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

The assumptions involved in the Nusselt condensation are as follows

(A) Laminar flow and constant properties are assumed for the liquid f

(B) Gas is assumed to be pure vapour and at a uniform temperature e

(C) Shear stress at the liquid-vapour interface is assumed to be neglig

(D) All of the above

Options :
8995141845. 1
8995141846. 2
8995141847. 3
8995141848. 4

Question Number : 23 Question Id : 899514463 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

In the Nusselt condensation, it is the balance of the following forces

(A) Inertia force, sinking effect (force) and friction force

(B) Inertia force and friction force

(C) Friction force and sinking effect (force)

(D) Inertia force and sinking effect (force)

Options :

8995141849. 1

8995141850. 2

8995141851. 3

8995141852. 4

Question Number : 24 Question Id : 899514464 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction/blowing, constant u_∞ and 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 III?

(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 :

8995141853. 1

8995141854. 2

8995141855. 3

8995141856. 4

Question Number : 25 Question Id : 899514465 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction/blowing, constant u_∞ and case ofPr ~ 1, what can you say about the flow field?

(A) $0 \leq y \leq (\delta \text{ } or \text{ } \delta_t)$ for $u = u_\infty$ and $T > T_\infty$

(B) $0 \leq y \leq (\delta \text{ } or \text{ } \delta_t)$ for $u < u_\infty$ and $T > T_\infty$

(C) $0 \leq y \leq (\delta \text{ } or \text{ } \delta_t)$ for $u < u_\infty$ and $T = T_\infty$

(D) $0 \leq y \leq (\delta \text{ } or \text{ } \delta_t)$ for $u > u_\infty$ and $T = T_\infty$

Options :

8995141857. 1
8995141858. 2
8995141859. 3
8995141860. 4

Question Number : 26 Question Id : 899514466 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction or blowing, constant u_∞ profile is $\frac{u}{u_\infty} = a + b\eta + c\eta^2$ where, ($\eta = \frac{y}{\delta(x)}$); the values of a, b, c are

(A) 1, -1, -2
(B) 0, 1, -2
(C) 0, -1, 2
(D) 0, 2, -1

Options :
8995141861. 1
8995141862. 2
8995141863. 3
8995141864. 4

Question Number : 27 Question Id : 899514467 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction or blowing, constant u_∞
profile is $\frac{u}{u_\infty} = 2\eta - \eta^2$ where, $(\eta = \frac{y}{\delta(x)})$; displacement thickness is:

(A) $\frac{2\delta}{3}$

(B) $\frac{\delta}{3}$

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

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

Options :

8995141865. 1

8995141866. 2

8995141867. 3

8995141868. 4

Question Number : 28 Question Id : 899514468 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a flow over a flat plate with no suction or blowing, constant u_∞, if the
is $\frac{u}{u_\infty} = 2\eta - \eta^2$ where, $(\eta = \frac{y}{\delta(x)})$; the momentum thickness δ_2 is:

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

(B) $\frac{2\delta}{3}$

(C) $\frac{2\delta}{15}$

(D) $\frac{2}{15}$

Options :

8995141869. 1
8995141870. 2
8995141871. 3
8995141872. 4

Question Number : 29 Question Id : 899514469 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For the velocity profile $\frac{u}{u_\infty} = 2\eta - \eta^2$ and $\frac{T_W - T(x,y)}{T_W - T_\infty} = 2\eta_T - \eta$
$\frac{y}{\delta(x)}$ $and\ \eta_T = \frac{y}{\delta_t(x)}$); for Pr = 1, the enthalpy thickness is equal to:

(A) $\frac{8\delta}{15}$
(B) $\frac{2\delta}{15}$
(C) 0
(D) δ_t

Options :
8995141873. 1
8995141874. 2
8995141875. 3
8995141876. 4

Question Number : 30 Question Id : 899514470 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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For laminar flow through a circular pipe of radius R, the velocity distrib

$u(r) = c\left[1 - \left(\frac{r}{R}\right)^2\right]$; (where, c is a constant), the bulk mean velocity is:

(A) $\frac{c}{3}$

(B) $\frac{c}{2}$

(C) c

(D) $\frac{2c}{3}$

Options :
8995141877. 1
8995141878. 2
8995141879. 3
8995141880. 4

Question Number : 31 Question Id : 899514471 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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For laminar flow through a circular pipe of radius R, the velocity
distributions are given by $u(r) = C$ and $T(r) = D\left[1 - \left(\frac{r}{R}\right)^2\right]$ respecti
and D are constants), the bulk mean temperature is:

(A) $\frac{4D}{5}$
(B) $\frac{2D}{3}$
(C) $\frac{D}{2}$
(D) D

Options :
8995141881. 1
8995141882. 2
8995141883. 3
8995141884. 4

Question Number : 32 Question Id : 899514472 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For flow over a flat plate, the flow velocity is decreased by a factor c
other variables constant in case of a laminar flow, the boundary

____

(A) Increases by a factor of 2
(B) Decreases by a factor of 2
(C) Increases by a factor of 4
(D) Decreases by a factor of 4

Options :

8995141885. 1
8995141886. 2
8995141887. 3
8995141888. 4

Question Number : 33 Question Id : 899514473 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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

(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 :
8995141889. 1
8995141890. 2
8995141891. 3
8995141892. 4

Question Number : 34 Question Id : 899514474 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

If blowing velocity is increased, boundary layer thickness ____________

(A) remains unchanged
(B) increases
(C) decreases
(D) changes randomly

Options :

8995141893. 1
8995141894. 2
8995141895. 3
8995141896. 4

Question Number : 35 Question Id : 899514475 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For the case of thin thermal boundary layer ($\delta_t \ll \delta$) over a flat p number is given by $Nu_x \sim Re_x^{1/2} Pr^{1/3}$. For a fixed location in the flow, number is increased from 1600 to 2500, the ratio of the old to the new N that location would be

(A) 16:25
(B) 25:16
(C) 5:4
(D) 4:5

Options :
8995141897. 1
8995141898. 2
8995141899. 3
8995141900. 4

Question Number : 36 Question Id : 899514476 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For a circular pipe whose diameter decreases linearly along the flow direc
mass flow rate and constant properties, the Reynolds Number of flow____
flow direction.

(A) Remains constant
(B) Decreases
(C) Increases
(D) Depends on fluid

Options :
8995141901. 1
8995141902. 2
8995141903. 3
8995141904. 4

Question Number : 37 Question Id : 899514477 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

For a circular pipe whose diameter decreases linearly along the flow direc
mass flow rate and constant properties, the bulk mean velocity ________ a
direction.

(A) Remains constant
(B) Decreases
(C) Increases
(D) Depends on Prandtl number

Options :
8995141905. 1
8995141906. 2
8995141907. 3
8995141908. 4

Question Number : 38 Question Id : 899514478 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Arrange the phenomenon according decreasing values of heat trans associated with them.

P. Natural convection in water

Q. Forced convection with water

R. Natural convection with air

S. Boiling heat transfer

(A) S Q P R

(B) P Q R S

(C) S P Q R

(D) S Q R P

Options :

8995141909. 1

8995141910. 2

8995141911. 3

8995141912. 4

Question Number : 39 Question Id : 899514479 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If the flow is steady, it means ________________

(A) Local and convective acceleration are zero.

(B) Local acceleration is zero, while convective acceleration is non

(C) Convective acceleration is zero, while local acceleration is non

(D) Both local and convective acceleration are non zero.

Options :

8995141913. 1

8995141914. 2

8995141915. 3

8995141916. 4

Question Number : 40 Question Id : 899514480 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a circular pipe whose diameter decreases linearly along the flow direc
mass flow rate and constant properties, the maximum velocity_______ al
direction.

(A) Remains constant

(B) Decreases

(C) Increases

(D) depends on Prandtl number

Options :

8995141917. 1

8995141918. 2

8995141919. 3

8995141920. 4

Question Number : 41 Question Id : 899514481 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical

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Correct Marks : 1 Wrong Marks : 0

In the fully developed region, for the flow through the circular pipe with heat flux, the driving temperature difference, $\Delta T = T_{wall}(z) - T_m(z)$,___ flow direction.

(A) Decreases
(B) Increases
(C) Increases first and then remains constant
(D) Remains constant

Options :
8995141921. 1
8995141922. 2
8995141923. 3
8995141924. 4

Question Number : 42 Question Id : 899514482 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

In the developing region, for flow through a circular pipe subjected to co flux, the driving temperature difference, $\Delta T = T_{wall}(z) - T_m(z)$,______ the flow direction.

(A) Decreases
(B) Increases
(C) Remains constant
(D) Decreases randomly

Options :
8995141925. 1
8995141926. 2
8995141927. 3

8995141928. 4

Question Number : 43 Question Id : 899514483 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Air flow generated by a fan operated by a 10 W power input convectivel
from 5 different heat sources of 10 W each. If air enters at 30 °C and m
temperature is 45 °C, the mass flow rate, in kg/s, is:

(A) 3.98

(B) 3.32

(C) 3.89

(D) 3.23

Options :

8995141929. 1

8995141930. 2

8995141931. 3

8995141932. 4

Question Number : 44 Question Id : 899514484 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Consider a heat source abridged to a plate spreader and the other sid
convectively cooled. If the heat source is much smaller than the heat spre

(A) as thickness increases spreading resistance decreases

(B) as thickness increases bulk thermal resistance increases

(C) bulk resistance is influenced by convective resistance

(D) both (A) and (B) are true

Options :

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8995141933. 1
8995141934. 2
8995141935. 3
8995141936. 4

Question Number : 45 Question Id : 899514485 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

A heat source dissipates constant power and is abridged to a heat spread
sink. As the heat source size decreases relative to heat spreader, then:

(A) average temperature and peak temperature of the heat source stay

(B) average temperature of the heat source increases

(C) average temperature of the heat source decreases

(D) average temperature of the heat source stays constant

Options :
8995141937. 1
8995141938. 2
8995141939. 3
8995141940. 4

Question Number : 46 Question Id : 899514486 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

If the adiabatic temperature of a device is high then the procedure t
improve heat dissipation from the device will be to:

(A) Increase flow rate
(B) Decrease device power
(C) Improve cross-stream mixing
(D) Decrease pressure drop

Options :
8995141941. 1
8995141942. 2
8995141943. 3
8995141944. 4

Question Number : 47 Question Id : 899514487 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Heat transfer coefficient in flow boiling is ___________ heat transfer co
boiling for the same surface, fluid combination and conditions.

(A) Lower than
(B) Higher than
(C) Equal to
(D) Any of the above depending the specific situation.

Options :
8995141945. 1
8995141946. 2
8995141947. 3
8995141948. 4

Question Number : 48 Question Id : 899514488 Question Type : MCQ Option Shuffling : No Display Question Number : Yes

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Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

DNB and Dryout represent the mechanisms associated with

(A) Film bioling
(B) Subcooled nucleate boiling
(C) Saturated nucleate boiling
(D) Critical heat flux

Options :
8995141949. 1
8995141950. 2
8995141951. 3
8995141952. 4

Question Number : 49 Question Id : 899514489 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

A heat source is placed on the bottom wall of a rectangular duct
approximated as parallel plates – top and bottom plates) and forced co
Flat plate correlation is appropriate when

(A) laminar flow conditions prevail.
(B) top plate is adiabatic.
(C) hydrodynamic and thermal boundary are not interacting between plates
(D) all the above

Options :
8995141953. 1
8995141954. 2
8995141955. 3

8995141956. 4

Question Number : 50 Question Id : 899514490 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For laminar boundary layer over a flat plate, Reynolds analogy is best va

(A) $\frac{dp}{dx}$ is zero only

(B) Pr = 1 only

(C) Both (A) and (B)

(D) $U_\infty = Constant$ and $\frac{dp}{dx} = 0$

Options :

8995141957. 1

8995141958. 2

8995141959. 3

8995141960. 4

Question Number : 51 Question Id : 899514491 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In similarity analysis, the similarity variable was defined as $\eta = y\sqrt{\frac{U_\infty}{\nu x}}$. 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 $\frac{y_2}{y_1}$, if $U_{\infty,2} = 9 \times U_{\infty,1}$ is

(A) 3
(B) $\frac{1}{3}$
(C) $\frac{1}{9}$
(D) 9

Options :
8995141961. 1
8995141962. 2
8995141963. 3
8995141964. 4

Question Number : 52 Question Id : 899514492 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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

(A) 1000

(B) 40000

(C) 10000

(D) 250

Options :
8995141965. 1
8995141966. 2
8995141967. 3
8995141968. 4

Question Number : 53 Question Id : 899514493 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

A concentric multi cylinder geometry comprising of two circular pipes a
the outside has the overall heat transfer coefficient to be 480 W/m^2
outermost area. The outermost diameter is twice the innermost diameter.
transfer coefficient, in W/m^2K, based on the innermost area would be

(A) 960

(B) 480

(C) 1920

(D) 120

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Options :
8995141969. 1
8995141970. 2
8995141971. 3
8995141972. 4

Question Number : 54 Question Id : 899514494 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

An experiment revealed that $\overline{Nu_L} = CRe_L^{0.5}Pr^n$. If the velocity of the f
by a factor of 4 and the characteristic length is increased by a factor of 2
new heat transfer coefficient to the original value is

(A) 1.0
(B) 0.3535
(C) 2.828
(D) 0.25

Options :
8995141973. 1
8995141974. 2
8995141975. 3
8995141976. 4

Question Number : 55 Question Id : 899514495 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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Experimental investigations were carried out for flow over a heated cy
cross section. The cylinder is oriented such that the diagonal of length 0.
the flow direction. The average Nusselt number is 50 and 150 when th
are air and water respectively. Assume the Reynolds number of flow to
that the Nusselt number is correlated as $\overline{Nu_L} = Re_L^m Pr^n$, where C, m a
known constants. The value of the index 'n' is

(A) 1.79
(B) 0.558
(C) 2.56
(D) 0.3905

Options :
8995141977. 1
8995141978. 2
8995141979. 3
8995141980. 4

Question Number : 56 Question Id : 899514496 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

In case of two fluids flowing in opposite direction in a concentric tube a
hot fluid changes from 200°C to 120°C, while the cold fluid temperatu
20°C to 100°C. The values of arithmetic mean temperature differenc
temperature difference, in °C, are _____ and ______ respectively

(A) 80, 80
(B) 100, infinity
(C) 100, 100
(D) 100, 72.82

Options :
8995141981. 1
8995141982. 2
8995141983. 3
8995141984. 4

Question Number : 57 Question Id : 899514497 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

The inner wall of a tube is maintained at 200°C, while cold fluid enters
and leaves at 90°C. The log mean temperature difference, in °C, is

(A) 317.36
(B) 140
(C) 60
(D) 137.83

Options :

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8995141985. 1
8995141986. 2
8995141987. 3
8995141988. 4

Question Number : 58 Question Id : 899514498 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

From the group of characteristics listed below, choose all that apply to D Nucleate Boiling (DNB).

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

Options :
8995141989. 1
8995141990. 2
8995141991. 3
8995141992. 4

Question Number : 59 Question Id : 899514499 Question Type : MCQ Option Shuffling : No Display Question Number : Yes

Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

List of processes and important points that occur in a boiling curve are gi

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 occu
curve for wall temperature controlled case with progressively *increasing*
temperature?

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

Options :
8995141993. 1
8995141994. 2
8995141995. 3
8995141996. 4

Question Number : 60 Question Id : 899514500 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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List of processes and important points that occur in a boiling curve are gi

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 occu
curve for heat flux controlled case with progressively *decreasing* heat flu

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

Options :
8995141997. 1
8995141998. 2
8995141999. 3
8995142000. 4

Question Number : 61 Question Id : 899514501 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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

(A) Liquid Metals

(B) Gases

(C) Water

(D) Glycerine

Options :

8995142001. 1

8995142002. 2

8995142003. 3

8995142004. 4

Question Number : 62 Question Id : 899514502 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintai
temperature surrounded by a high Prandtl number fluid, the scale of the
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) $\frac{\alpha}{H} Ra_H^{\frac{1}{2}} Pr^{\frac{1}{2}}$

Options :

8995142005. 1

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8995142006. 2
8995142007. 3
8995142008. 4

Question Number : 63 Question Id : 899514503 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

In natural 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 an

(D) Neither thermal or hydrodynamic boundary layer thickness (δ_T o

Options :
8995142009. 1
8995142010. 2
8995142011. 3
8995142012. 4

Question Number : 64 Question Id : 899514504 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintai
temperature surrounded by a low Prandtl number fluid, the thickness of t

(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 r
the height of the vertical plate

Options :
8995142013. 1
8995142014. 2
8995142015. 3
8995142016. 4

Question Number : 65 Question Id : 899514505 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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Consider natural convection around a vertical hot plate maintain
temperature surrounded by a high Prandtl number fluid, the distance fro
velocity peak is

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

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

where H is the height of the vertical plate and Ra_H is the Rayleigh r
the height of the vertical plate

Options :
8995142017. 1
8995142018. 2
8995142019. 3
8995142020. 4

Question Number : 66 Question Id : 899514506 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Grashoff number is defined as

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

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

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

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

Options :

8995142021. 1

8995142022. 2

8995142023. 3

8995142024. 4

Question Number : 67 Question Id : 899514507 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

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Consider natural convection around a vertical hot plate maintained at co
surrounded by a low Prandtl number fluid, the thermal boundary layer thi

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

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

Options :
8995142025. 1
8995142026. 2
8995142027. 3
8995142028. 4

Question Number : 68 Question Id : 899514508 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Consider natural convection around a vertical hot plate maintained at co
surrounded by a high Prandtl number fluid, the Nusselt number is

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

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

Options :
8995142029. 1
8995142030. 2
8995142031. 3
8995142032. 4

Question Number : 69 Question Id : 899514509 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

The critical Reynolds number in external flows (flow over a flat plate) is

(A) 2300
(B) 5×10^5
(C) 10000
(D) 300

Options :
8995142033. 1

8995142034. 2
8995142035. 3
8995142036. 4

Question Number : 70 Question Id : 899514510 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Eddy thermal diffusivity is a

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

Options :
8995142037. 1
8995142038. 2
8995142039. 3
8995142040. 4

Question Number : 71 Question Id : 899514511 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

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General rule of thumb for designing parallel plate heat sinks is to ensure

(A) that flow hydraulic diameter-to-length is such that flow length i
thermal development length.

(B) that flow hydraulic diameter-to-length is such that flow length i
thermal development length.

(C) that flow hydraulic diameter-to-length is such that flow length i
equal to thermal development length.

(D) There are no general thumb rules.

Options :
8995142041. 1
8995142042. 2
8995142043. 3
8995142044. 4

Question Number : 72 Question Id : 899514512 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Optimal thermal resistance of a forced convective parallel plate heat sink

(A) is always smaller than thermal resistance of heat sink without by

(B) is always greater than thermal resistance of heat sink without by

(C) is always equal to the thermal resistance of heat sink without by

(D) depends on gravity

Options :
8995142045. 1
8995142046. 2
8995142047. 3
8995142048. 4

Question Number : 73 Question Id : 899514513 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Fan selection for cooling should consider: (P) flow required, (Q) noise lev efficiency

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

Options :
8995142049. 1
8995142050. 2
8995142051. 3
8995142052. 4

Question Number : 74 Question Id : 899514514 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Temperature difference along the heat pipe (from evaporator to condense sum of the temperature difference needed for:

(A) conduction across the evaporator wall and wick
(B) conduction across the condenser wall and wick
(C) to provide the vapor pressure difference to drive vapor from eva condenser
(D) all the above.

Options :

8995142053. 1
8995142054. 2
8995142055. 3
8995142056. 4

Question Number : 75 Question Id : 899514515 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Line Question Option : No Option Orientation : Vertical
Correct Marks : 1 Wrong Marks : 0

Desirable wick characteristics for a heat pipe include:

(A) small effective capillary radius
(B) low permeability
(C) low effective thermal conductivity
(D) all the above

Options :
8995142057. 1
8995142058. 2
8995142059. 3
8995142060. 4