Question Paper Preview

Subject Name: Aerospace Engineering

Display Number Panel: Yes
Group All Questions: No

Question Number : 1 Question Id : 7621615161 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The Eigen values of $A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$ are

Options :

1. 1 and 3
2. 1 and -3
3. 2 and 4
4. 2 and – 4

Question Number : 2 Question Id : 7621615162 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $f(x, y) = tan^{-1}\frac{x}{y}$ then $\frac{\partial^2 f}{\partial y \partial x} =$

Options :

1. $\frac{x^2-y^2}{(x^2+y^2)^2}$
2. $\frac{x^2+y^2}{(x^2+y^2)^2}$
3. $\frac{x^2y^2}{(x^2+y^2)^2}$
4. $\frac{y^2-x^2}{(x^2+y^2)^2}$

Question Number : 3 Question Id : 7621615163 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

It is given that the function $f(x) = x\sqrt{\alpha^2 - x^2}$ satisfies all the conditions of Rolle's mean value theorem $[o, \alpha]$. Then c of the mean value theorem is

Options :

1. $\frac{\alpha}{2}$
2. $\alpha\sqrt{2}$

3. $\frac{-\alpha}{\sqrt{2}}$

4. $\frac{\alpha}{\sqrt{2}}$

Question Number : 4 Question Id : 7621615164 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $\lim_{x\to 0}\frac{\tan x - x}{x^2 \tan x} = \lambda$ then $\lambda =$

Options :

1. $\frac{1}{3}$

2. $\frac{1}{4}$

3. $\frac{1}{5}$

4. $\frac{1}{6}$

Question Number : 5 Question Id : 7621615165 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $p = \frac{dy}{dx}$ then the general solution of $(y - xp)(p - 1) = p$ is

Options :

1. $y = cx - \frac{c}{c-1}$

2. $y = cx + \frac{c}{c-1}$

3. $y = \frac{cx}{c-1}$

4. $y = \frac{cx}{c+1}$

Question Number : 6 Question Id : 7621615166 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The solution of the differential equation $4\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + y = 0$ is

Options :

1. $y = c_1 e^{\frac{x}{2}} + c_2 e^x$

2. $y = c_1 e^{\frac{x}{2}} + c_2 x$

3. $y = (c_1 + c_2 x) e^{\frac{x}{2}}$

4. $y = (c_1 + c_2 x) e^x$

Question Number : 7 Question Id : 7621615167 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $\phi(x, y, z) = x^2 + \sin y + z$,then grad ϕ at $(0, \frac{\pi}{2}, 1)$ is

Options :

1. $i+j$
2. k
3. $j-k$
4. $2j+k$

Question Number : 8 Question Id : 7621615168 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If L[f(t)] denotes the Laplace transform of f(t) , and $s+\alpha>0$, then $L[e^{-\alpha t}]=$

Options :

1. $\frac{1}{s-\alpha}$
2. $\frac{1}{s}$
3. $\frac{1}{s+\alpha}$
4. $\frac{s}{s+\alpha}$

Question Number : 9 Question Id : 7621615169 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $f(z)=\frac{z^3}{(z-2)(z-3)(z-1)^2}$ then the residue of f(z) at z=3 is

Options :

1. $\frac{27}{4}$
2. $\frac{1}{4}$
3. $\frac{3}{4}$
4. $\frac{5}{4}$

Question Number : 10 Question Id : 7621615170 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If $F=x^2i+y^2j$ then the value of $\int F.dr$ along the line y=x from (0,0) to (1,1) is

Options :

1. $\frac{1}{3}$
2. $\frac{2}{3}$
3. $\frac{4}{3}$
4. 1

Display Number Panel: Yes
Group All Questions: No

Question Number : 11 Question Id : 7621615171 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about Earth's atmosphere.

(I) Longitude and latitude of the location on the Earth.

(II) Altitude above the sea level.

(III) Season in the year.

(IV) Time in a day.

(V) Sun-spot activities.

The temperature and pressure in the Earth's atmosphere depends on

Options :

1. I, II and III
2. I, III and IV
3. II, III and IV
4. I, II, III and IV

Question Number : 12 Question Id : 7621615172 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about layers in the Earth's atmosphere.

(I) The troposphere is wider at the equator but narrower at the poles.

(II) The troposphere is narrower at the equator but wider at the poles.

(III) The ozone layer is predominantly located in the lower segment of the stratosphere.

(IV) The ozone layer is predominantly located in the upper segment of the stratosphere.

Choose the CORRECT option in the following:

Options :

1. I and III
2. II and III
3. II and IV
4. I and IV

Question Number : 13 Question Id : 7621615173 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the velocity field given by $u = y/(x^2 + y^2)$ and $v = -x/(x^2 + y^2)$. The equation of streamlines passing through the point (0, 5) will be given by

Options :

1. $x + y = 5$
2. $x^2 + y^2 = 25$
3. $xy = 25$
4. $x^2 - y^2 = 25$

Question Number : 14 Question Id : 7621615174 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For the flow in a convergent-divergent nozzle, which of the following statement is CORRECT?

Options :

1. The velocity is minimum at the throat.
2. The pressure is maximum at the throat.
3. The pressure is minimum at the throat.
4. When the throat is choked, the throat pressure should be higher than the exit pressure to obtain subsonic flow in the divergent section.

Question Number : 15 Question Id : 7621615175 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider an airfoil kept in a flow with a free-stream velocity of 20 m/s. The velocity at a given point on the airfoil is 40 m/s. The pressure coefficient at this point will be

Options :

1. 2
2. -3
3. 3
4. -1/3

Question Number : 16 Question Id : 7621615176 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a doublet flow, the stream function in cylindrical coordinates will be given by

Options :

1. $-\frac{\kappa \sin\theta}{2\pi r}$
2. $-\frac{\kappa \cos\theta}{2\pi r}$

3. $\frac{\kappa \sin\theta}{2\pi r^2}$

4. $\frac{\kappa \cos\theta}{2\pi r^2}$

Question Number : 17 Question Id : 7621615177 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The purpose of fins on a rocket is to

Options :

1. Reduce drag

2. Generate lift

3. Provide stability

4. Streamline shape

Question Number : 18 Question Id : 7621615178 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

What is the main purpose of wing flaps?

Options :

1. to decrease the angle of descent without increasing the airspeed.

2. to increase the angle of descent without increasing the airspeed.

3. to decrease the angle of descent by increasing the airspeed.

4. to decrease the drag.

Question Number : 19 Question Id : 7621615179 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For an elliptical lift distribution over wing span, the downwash

Options :

1. Increases with angle of attack

2. Decreases with angle of attack

3. Is a non-zero constant

4. Is equal to zero.

Question Number : 20 Question Id : 7621615180 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about Hohmann Transfer.

(I) It is a two-impulse elliptical transfer between two co-planar circular orbits.

(II) The transfer itself consists of an elliptical orbit with a perigee at the outer orbit and an apogee at the inner orbit.

(III) The fundamental assumption behind is that, there is only one body which exerts a gravitational force on the body of interest, such as a satellite.

(IV) Additional bodies can share the orbit which could induce a gravitational attraction on the body of interest.

Which of the above is/are CORRECT?

Options :

1. II and III only
2. I and III only
3. II, III and IV
4. I, II and IV

Question Number : 21 Question Id : 7621615181 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The force exerted by a jet impinging on a fixed plate inclined at an angle θ with the jet is

Options :

1. $(\rho Av \sin 2\theta)/4$
2. $\rho Av \sin \theta$
3. $(\rho Av^2 \sin 2\theta)/2$
4. $\rho Av^2 \sin 2\theta$

Question Number : 22 Question Id : 7621615182 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Multi stage centrifugal pumps are used to

Options :

1. Give high discharge
2. Produce high heads
3. Pump viscous fluids
4. Produce low heads

Question Number : 23 Question Id : 7621615183 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the velocity field V = xi

Options :

1. For an incompressible fluid this field satisfies conservation of mass.
2. The acceleration of the particle in this field decreases with x.
3. The acceleration of the particle in this field increases with x.
4. The pressure of an incompressible and inviscid fluid increase with x.

Question Number : 24 Question Id : 7621615184 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

What is the primary control surface located on the wings that control the roll of the glider clockwise or counter-clockwise?

Options :

1. Stabilizer
2. Rudder
3. Elevator
4. Aileron

Question Number : 25 Question Id : 7621615185 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

With the increase of camber of an airfoil, the induced lift will

Options :

1. will Increase
2. will Decrease
3. remain same
4. first decreases and then remain constant

Question Number : 26 Question Id : 7621615186 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The aspect ratio (span / chord) shows the relationship between the span and chord of a wing. Which wing parameters would create the maximum lift?

Options :

1. Span = 10, chord = 5
2. Span = 10, chord = 2
3. Span = 15, chord = 5
4. Span = 15, chord = 2

Question Number : 27 Question Id : 7621615187 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The induced drag for aerofoil is

Options :

1. Infinite
2. Zero
3. Half of finite wing.
4. Depends upon aerofoil.

Question Number : 28 Question Id : 7621615188 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following combinations of velocity (V) and area (S)

(I) $V\sqrt{2}, S$

(II) $V/2, 2S$

(III) $V, 2S$

(IV) $2V, S/2$

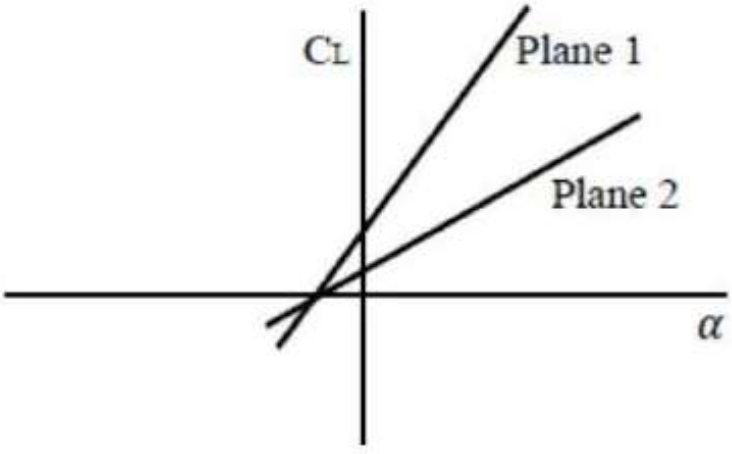
For a certain angle of attack, at a given altitude the lift will be doubled for which of the above combinations?

Options :

1. I, II and IV
2. II and III
3. I, III and IV
4. II, III and IV

Question Number : 29 Question Id : 7621615189 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the C_L vs α curve as shown in the following Figure and choose the correct choice



Figure

Options :

1. Plane 1 has higher aspect ratio

2. Plane 2 has higher aspect ratio

3. Both Plane 1 and Plane 2 have same aspect ratios

4. Aspect ratio cannot be determined

Question Number : 30 Question Id : 7621615190 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If the airfoil thickness increases, the critical Mach number l

Options :

1. will decrease

2. will increase

3. will remain constant

4. cannot be determined

Question Number : 31 Question Id : 7621615191 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

At half chord length from the leading edge, which of the following airfoil will have location of the maximum camber?

Options :

1. NACA 5212

2. NACA 2512

3. NACA 1225

4. NACA 2215

Question Number : 32 Question Id : 7621615192 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A structural member supports loads, which produce at a particular point, a state of pure shear stress of 50 N/mm^2. At what angles are the principal planes oriented with respect to the plane of pure shear?

Options :

1. $\pi/6$ and $2\pi/3$

2. $\pi/4$ and $3\pi/4$

3. $\pi/4$ and $\pi/2$

4. $\pi/2$ and π

Question Number : 33 Question Id : 7621615193 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If the load factor of an aircraft turning at a constant altitude is 2, keeping the speed constant the required lift coefficient will be

Options :

1. Same for turning as well as level flights

2. Half for the turning flight as compared to level flight

3. Double for the turning flight as compared to level flight

4. Four times for the turning flight as compared to level flight

Question Number : 34 Question Id : 7621615194 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In a quasi-steady process, assuming the entropy increases for a substance. Then the rise in temperature will be maximum for

Options :

1. Process with constant enthalpy.

2. Isobaric process

3. Isothermal process

4. Isochoric process

Question Number : 35 Question Id : 7621615195 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statement is CORRECT?

Options :

1. Heat and work are intensive properties

2. Heat is intensive property but work is extensive property

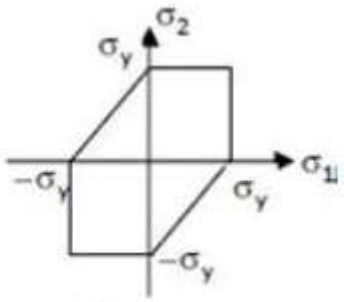
3. Heat is a point function and work is an extensive property

4. Heat and work are path functions

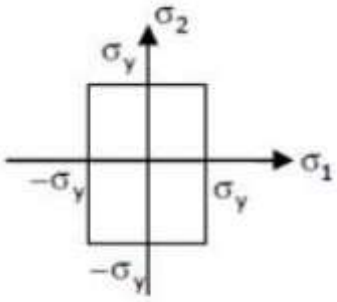
Question Number : 36 Question Id : 7621615196 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Match the following criteria of material failure, under biaxial stresses σ_1 and σ_2 and yield stress , with their corresponding graphic representations.

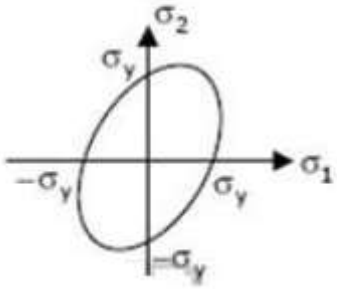
P. Maximum-normal-stress criterion L.



Q. Maximum-distortion-energy criterion M.



R. Maximum-shear–stress criterion N.

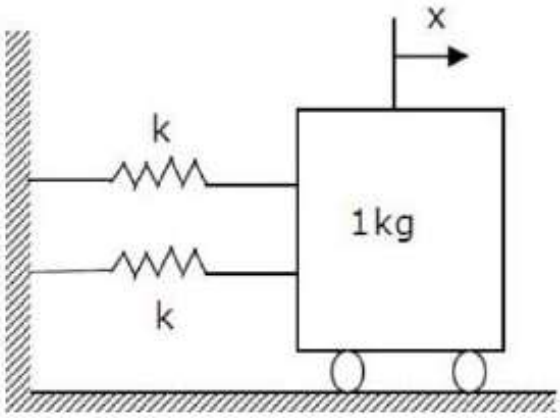


Options :

1. P-M, Q-L, R-N
2. P-N, Q-M, R-L
3. P-M, Q-N, R-L
4. P-N, Q-L, R-M

Question Number : 37 Question Id : 7621615197 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following Figure.



Figure

If the surface is frictionless, the natural frequency will be

Options :

1. 32 Hz
2. 13 Hz
3. 76 Hz
4. 51 Hz

Question Number : 38 Question Id : 7621615198 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statements is NOT correct?

Options :

1. An airplane which has negative aerodynamic damping will be dynamically unstable.
2. Forces and moments arising over the airplane due to its motion provide negative aerodynamic damping.
3. Forces and moments arising over the airplane due to its motion provide positive aerodynamic damping.
4. Dynamic stability is usually specified by the time it takes a disturbance to be damped to half of its initial amplitude.

Question Number : 39 Question Id : 7621615199 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The devices or modifications to the wing that increase the stall angle of attack are _____

Options :

1. Flaps
2. Winglets
3. Trim tabs
4. High-lift devices

Question Number : 40 Question Id : 7621615200 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A typical turbofan engines have the bypass ratio of _____

Options :

1. 2:1
2. 4:1
3. 8:1
4. 16:1

Question Number : 41 Question Id : 7621615201 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For the steady, fully developed flow inside a straight pipe of diameter D, neglecting gravity effects, the pressure drop Δp over a length L and the wall shear stress τ are related by

Options :

1. $\tau_w = \frac{\Delta p D^2}{4L^2}$
2. $\tau_w = \frac{\Delta p D}{2L}$
3. $\tau_w = \frac{\Delta p D}{4L}$
4. $\tau_w = \frac{4\Delta p D}{L}$

Question Number : 42 Question Id : 7621615202 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements for the turbulent flow of a fluid through a circular pipe of diameter (D).

(I) The fluid is well-mixed

(II) The fluid is unmixed

(III) Reynolds number (Re_D) > 2300

(IV) Reynolds number (Re_D) < 2300

Which of the above is/are TRUE?

Options :

1. I only
2. I and III
3. II and III
4. I and IV

Question Number : 43 Question Id : 7621615203 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a simply supported beam of length = 50h, with a rectangular cross-section of depth = h, and width = 2h. The beam carries a vertical point load = P, at its mid-point. Ratio of the maximum shear stress to the maximum bending stress in the beam will be

Options :

1. 0.02
2. 0.1
3. 0.05

4. 0.01

Question Number : 44 Question Id : 7621615204 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The damping ratio of a single degree of freedom spring-mass-damper system with mass of 2 kg, stiffness 200 N/m and viscous damping coefficient of 40 N.s/m is

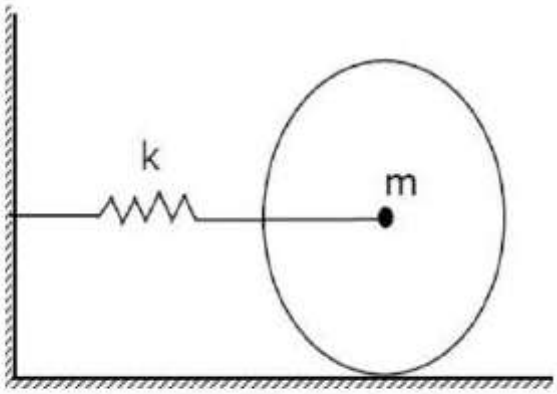
Options :

1. 0.5
2. 1.0
3. 1.25
4. 2.0

Question Number : 45 Question Id : 7621615205 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a disc of mass (m), which is attached to a spring of stiffness (k) as shown in the following Figure.

The disc rolls without slipping on a horizontal surface. The natural frequency of vibration of the system will be



Figure

Options :

1. $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$
2. $\frac{1}{2\pi}\sqrt{\frac{2k}{m}}$
3. $\frac{1}{2\pi}\sqrt{\frac{2k}{3m}}$
4. $\frac{1}{2\pi}\sqrt{\frac{3k}{2m}}$

Question Number : 46 Question Id : 7621615206 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In an aircraft, constant roll rate can be produced using ailerons by applying

Options :

1. a step input

2. a ramp input

3. a sinusoidal input

4. an impulse input

Question Number : 47 Question Id : 7621615207 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The shadow graph optical flow visualization technique depends on the

Options :

1. First derivative of density with respect to spatial coordinate.

2. Second derivative of density with respect to spatial coordinate.

3. Third derivative of density with respect to spatial coordinate.

4. Fourth derivative of density with respect to spatial coordinate.

Question Number : 48 Question Id : 7621615208 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A rocket is to be launched from the bottom of a very deep crater on Mars for earth return. The specific impulse of the rocket, measured in seconds, is to be normalized by the acceleration due to gravity at

Options :

1. The bottom of the crater on Mars

2. Mars standard sea level

3. Earth's standard sea level

4. the same depth of the crater on earth

Question Number : 49 Question Id : 7621615209 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following is the CORRECT combination of green-house gases?

Options :

1. Water Vapor, Oxygen, Methane, Nitrous Oxide, and Ozone.

2. Water Vapor, Carbon-dioxide, Methane, Nitrous Oxide, and Ozone.

3. Water Vapor, Carbon-dioxide, Hydrogen, Nitrous Oxide, and Ozone.

4. Water Vapor, Carbon-dioxide, Methane, Sulphur-dioxide, and Ozone.

Question Number : 50 Question Id : 7621615210 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The minimum period that any free flight object can have in orbit around the earth (also known as "Schuler" period) is

Options :

1. 84.4 minutes
2. 104.4 minutes
3. 60 minutes
4. 12 hours

Question Number : 51 Question Id : 7621615211 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

When the free-stream velocity in a subsonic wind tunnel test-section is decreased by 2 times, the power requirements to run the tunnel will be

Options :

1. decreased by 2 times
2. decreased by 4 times
3. decreased by 8 times
4. increased by 4 times

Question Number : 52 Question Id : 7621615212 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The Prandtl-Meyer supersonic expansion function (K) can be written as (γ = ratio of specific heats)

Options :

1. $K = \frac{\gamma}{\gamma-1}$
2. $K = \frac{\gamma-1}{\gamma+1}$
3. $K = \frac{\gamma-1}{\gamma}$
4. $K = \frac{\gamma+1}{\gamma-1}$

Question Number : 53 Question Id : 7621615213 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Assume that a planet is revolving around the Sun in an elliptical orbit with eccentricity (e = 0.4). The ratio of its velocities at perigee to apogee will be

Options :

1. 0.4
2. 0.43
3. 2.3
4. 2.5

Question Number : 54 Question Id : 7621615214 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements.

(I) The volumetric change of the fluid caused by a resistance is known as compressibility.

(II) The density of water is maximum at 4°C.

(III) The bulk modulus of elasticity decreases with increase in pressure.

(IV) Viscosity of liquids is appreciably affected by change in pressure.

Which of the above statements is/are TRUE?

Options :

1. I only
2. I and II
3. III and IV
4. III only

Question Number : 55 Question Id : 7621615215 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The cast iron has the Poisson's ratio in the range of _____

Options :

1. $0.1 < \upsilon < 0.2$
2. $0.23 < \upsilon < 0.27$
3. $0.25 < \upsilon < 0.33$
4. $0.4 < \upsilon < 0.6$

Question Number : 56 Question Id : 7621615216 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a cross-sectional area over which the velocity is zero in one half and uniform over the rest half.

The momentum-correction factor will be

Options :

1. 1
2. 4/3
3. 2
4. 4

Question Number : 57 Question Id : 7621615217 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a 2-dimensional, steady and incompressible flow over an airfoil. The free-stream velocity sufficiently far away from the airfoil is found to be 30 m/s where the distances between streamlines are 2 cm. The velocity near the airfoil where the streamlines are 1.5 cm apart, will be

Options :

1. 11.25 m/s
2. 22.5 m/s
3. 33 m/s
4. 40 m/s

Question Number : 58 Question Id : 7621615218 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statements is CORRECT for turbulent

Options :

1. The eddy viscosity is a function of temperature only.
2. The eddy viscosity is a physical property of the fluid.
3. The eddy viscosity depends on the flow.
4. The eddy viscosity is independent of the flow.

Question Number : 59 Question Id : 7621615219 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If the perturbation velocity is 2 m/s and free stream velocity is 8 m/s. Using small perturbation theory the pressure coefficient in 2-D planar flows will be:

Options :

1. -1/8
2. -1/4
3. -8
4. -1/2

Question Number : 60 Question Id : 7621615220 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

An oblique shock wave with a wave angle of $\beta = 60^\circ$ is generated from a wedge angle of $\theta = 30^\circ$. The ratio of Mach number downstream of the shock to its normal component will be

Options :

1. $2/\sqrt{3}$
2. 0.87
3. 0.5
4. 2

Question Number : 61 Question Id : 7621615221 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If an aircraft is in cruise motion at Mach 3, where the outside air temperature is found to be 350^0 K. The stagnation temperature at the nose of the aircraft will be? (For air, the specific heat ratio, $\gamma = 1.4$)

Options :

1. 980^0 K
2. 1610^0 K
3. 350^0 K
4. 98^0 K

Question Number : 62 Question Id : 7621615222 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a thin-walled-closed and a thin-walled-open tubes with the radius, r = 10 mm and thickness, t = 1 mm in both cases. The ratio of torsional rigidity of thin-walled-closed tube to thin-walled-open tube will be

Options :

1. 100
2. 200
3. 300
4. 400

Question Number : 63 Question Id : 7621615223 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the jet exhaust through an under expanded nozzle

(I) Normal shock wave

(II) Expansion fans

(III) Subsonic diffusion

(IV) Supersonic diffusion

The pressure equalization takes place through which of the following combinations?

Options :

1. I and III
2. I and IV
3. II and III
4. II and IV

Question Number : 64 Question Id : 7621615224 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements

(I) Airy stress function can be used only for two-dimensional problems.

(II) The duration of the load applied affects CREEP.

(III) In the constitutive equations of a generalized anisotropic solid, the numbers of independent elastic constants are 21.

Which of the above is/are CORRECT?

Options :

1. I only
2. I and III
3. II and III
4. I, II and III

Question Number : 65 Question Id : 7621615225 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The roll stability of a glider can be improved if the wing has mainly

Options :

1. Sweep angle
2. Anhedral
3. Dihedral
4. Winglets

Question Number : 66 Question Id : 7621615226 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a steady, level turning flight of an aircraft with the load factor ($n = 3$). The ratio of the horizontal component of lift to the weight of aircraft will be

Options :

1. $\sqrt{2}$
2. $\frac{1}{\sqrt{2}}$
3. $2\sqrt{2}$
4. $\frac{1}{2\sqrt{2}}$

Question Number : 67 Question Id : 7621615227 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the fluid flow past a wooden wedge (semi-vertex angle, $\theta = 20$) at Mach 10. The similarity parameter for this flow will be?

Options :

1. $\frac{10\pi}{9}$
2. $\frac{20\pi}{9}$
3. $\frac{90}{\pi}$
4. $\frac{45}{\pi}$

Question Number : 68 Question Id : 7621615228 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If an open loop unstable linear system is represented by $H(s) = \frac{1}{(s-1)(s+2)}$, its closed-loop characteristic equation will be

Options :

1. $s^2 + s - 1 = 0$
2. $s^2 + 2s - 1 = 0$
3. $s^2 + s + 1 = 0$
4. $s^2 + s - 2 = 0$

Question Number : 69 Question Id : 7621615229 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about the control system.

(I) The nature of bandwidth for a good control system should be small.

(II) The steady state error is zero in closed loop control systems.

(III) Gauss meter controls the speed of D.C. motor.

(IV) A good control system should be sensitive to input signals (except noise).

Which of the above statements is/are TRUE?

Options :

1. I and II
2. II and III
3. II and IV
4. IV only

Question Number : 70 Question Id : 7621615230 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statement is WRONG?

Options :

1. In an open-loop control system the output is independent of control input whereas, in closed-loop system the control action is somehow dependent on the output.

2. In a closed-loop control system the output is independent of control input whereas, in an open-loop system the control action is somehow dependent on the output.

3. The positive value of feedback gain in a closed loop control system will decrease the overall gain.

4. The closed-loop system has tendency to oscillate.

Question Number : 71 Question Id : 7621615231 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The satellite orbits are elliptical with a constantly varying radius. Since the satellite's velocity depends on this varying radius, it changes as well. To resolve this problem, an eccentric anomaly (E) is defined as:

Take ϑ = True Anamoly

Options :

1. $E = e\cos\vartheta/(1 + e\cos\vartheta)$

2. $E = (e - 2\cos\vartheta)/(1 + e\cos\vartheta)$

3. $E = (2e + \cos\vartheta)/(1 - e\cos\vartheta)$

4. $E = (e + \cos\vartheta)/(1 + e\cos\vartheta)$

Question Number : 72 Question Id : 7621615232 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Altimeter works on

Options :

1. Differential pressure sensing.

2. No air pressure sensing.

3. Mono pressure sensing.

4. Radar sensing.

Question Number : 73 Question Id : 7621615233 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The Air Speed Indicator (ASI) is the instrument that

Options :

1. Has both Pitot and static ports

2. Utilizes Pitot port only

3. Utilizes Static port only

4. Does not operate on differential pressure sensing

Question Number : 74 Question Id : 7621615234 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following is not an example of laminar composite?

Options :

1. Wood
2. Bi-metallic
3. Coatings/Paints
4. Claddings

Question Number : 75 Question Id : 7621615235 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The oxidizing power is generally determined in terms of electro-negativity. Which of the following substances has the highest electro-negativity?

Options :

1. Hydrogen
2. Fluorine
3. Oxygen
4. Chlorine

Question Number : 76 Question Id : 7621615236 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following beams.

(I) Simply supported beams

(II) Cantilever beams

(III) Overhanging beams

(IV) Fixed beams

(V) Continuous beams

Which of the above are statically determinate beams?

Options :

1. I, II, and IV
2. I, II, and III
3. II, III and IV
4. III, IV and V

Question Number : 77 Question Id : 7621615237 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

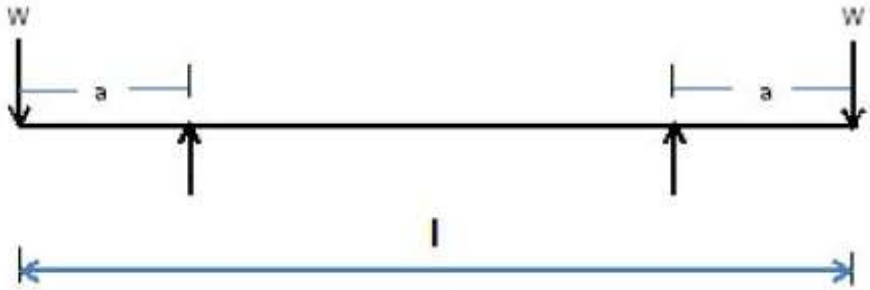
Consider a cantilever beam with uniformly distributed load starting from zero. The shear force diagram will be

Options :

1. Horizontal line parallel to x-axis
2. Line inclined to x-axis
3. Parabolic curve
4. Cubic curve

Question Number : 78 Question Id : 7621615238 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider an automobile axle with the loads as shown in the following Figure



Figure

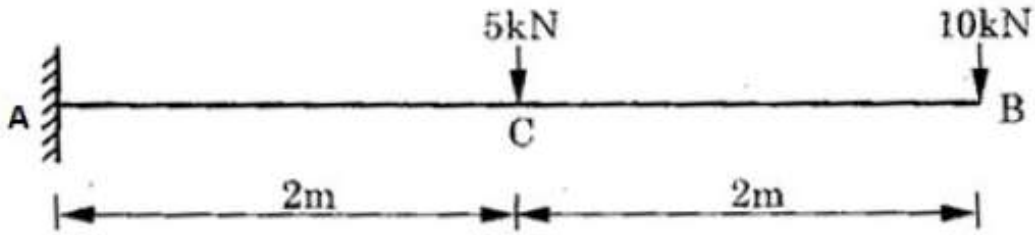
The maximum bending moment will be

Options :

1. Wl
2. W(l-a)
3. W(l+a)
4. Wa

Question Number : 79 Question Id : 7621615239 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the beam with loads as shown in the following Figure



Figure

The slope of the bending moment diagram between B and C will be

Options :

1. 15 kN

2. 10 kN

3. Zero

4. 20 kN

Question Number : 80 Question Id : 7621615240 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The Bernoulli's equation is valid for which of the following Mach number ranges?

Options :

1. $M \leq 0.5$

2. $0.5 \leq M \leq 1$

3. $M \leq 0.3$

4. $0.7 \leq M \leq 1.2$

Question Number : 81 Question Id : 7621615241 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

As compared to symmetrical airfoil, the angle of stall for a cambered airfoil

Options :

1. is less

2. is more

3. is same

4. cannot be determined

Question Number : 82 Question Id : 7621615242 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following staments

(I) Lift induced drag is caused by vortices.

(II) Aileron is primarily used for pitch.

(III) Slots in flaps decrease the stall angle.

Which of the above statements is/are TRUE?

Options :

1. I only

2. Both, II and III

3. III only

4. Both, I and III

Question Number : 83 Question Id : 7621615243 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements.

(I) The conventional vertical tail of an aircraft contributes toward longitudinal stability.

(II) The conventional vertical tail of an aircraft contributes toward both lateral and directional stability.

(III) If the C.G. of an aircraft moves forward, the efforts required for trimming the aircraft will be increased.

(IV) Keeping the tail area same, if the elevator size is decreased the static longitudinal stability will also decrease.

Which of the above statements is/are TRUE?

Options :

1. I only
2. II and III
3. I and IV
4. IV only

Question Number : 84 Question Id : 7621615244 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The local skin friction coefficient for a compressible fluid in laminar boundary layer will be

Options :

1. $c_{fx} = \frac{f(M_\infty)}{(Re_x)^{0.2}}$
2. $c_{fx} = \frac{f(M_\infty)}{(Re_x)^{0.5}}$
3. $c_{fx} = \frac{f(M_\infty)}{(Re_x)^{1/7}}$
4. Independent of free-stream Mach number.

Question Number : 85 Question Id : 7621615245 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider an airplane in level turn.

(I) The highest possible load factor.

(II) The lowest possible velocity.

(III) The highest possible velocity.

To obtain both a small turn radius and a large turn rate, which of the above is/are TRUE?

Options :

1. II only
2. I and III

3. I and II

4. III only

Question Number : 86 Question Id : 7621615246 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements for Blasius Boundary Layers.

(I) For laminar flows the typical value of shape factor (H) is approximately 2.6

(II) For turbulent flows the shape factor falls in the range of $3.3 - 3.4$

(III) The high value of shape factor reflects, weaker adverse pressure gradient.

(IV) Higher adverse pressure gradient increases the Reynolds number at which transition into turbulence may occur.

Which of the above statements is/are CORRECT?

Options :

1. I only

2. I and II

3. II, III and IV

4. III and IV

Question Number : 87 Question Id : 7621615247 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In supersonic flows, which of the following waves can never be made isentropic?

Options :

1. Mach line

2. Expansion wave

3. Shock wave

4. Neither Mach line nor Expansion and Shock waves

Question Number : 88 Question Id : 7621615248 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If M_1 and M_2 are the upstream and downstream Mach numbers across a normal shock wave, then which of the following is CORRECT?

Options :

1. $(M_2)_{\text{Minimum}} = \sqrt{\frac{\gamma + 1}{\gamma - 1}}$

2. $(M_2)_{Minimum} = \sqrt{\frac{\gamma+1}{2\gamma}}$

3. $(M_2)_{Maximum} = \sqrt{\frac{\gamma+1}{2\gamma}}$

4. $(M_2)_{Minimum} = \sqrt{\frac{\gamma-1}{2\gamma}}$

Question Number : 89 Question Id : 7621615249 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a turbulent boundary layer over a flat plate. The approximate value of shape factor at which the separation of boundary layer takes place, is

Options :

1. 1.4
2. 2.4
3. 0
4. 3.5

Question Number : 90 Question Id : 7621615250 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Based on free-stream velocity and momentum thickness of a boundary layer, the typical value of critical Reynolds number is

Options :

1. 2300
2. 5×10^5
3. 350
4. 200

Question Number : 91 Question Id : 7621615251 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If a 2-dimensional velocity field is given by $\vec{V} = (2x^3y\hat{i} - 3x^2y^2\hat{j})$. The flow field is

Options :

1. Rotational
2. Incompressible
3. Irrotational
4. Unsteady and compressible

Question Number : 92 Question Id : 7621615252 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The circulation at the mid-point of a flat plate, at 6° to a free-stream speed of 40 m/s, will be

Options :

1. $\pi/6$
2. $\pi/3$
3. $8\pi/3$
4. $4\pi/3$

Question Number : 93 Question Id : 7621615253 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider a square ring vortex of side 2a. If each sides has the strength Γ, the velocity induced at the center of the ring is

Options :

1. $3\sqrt{2}\Gamma/\pi a$
2. $2\sqrt{2}\Gamma/a$
3. $\sqrt{2}\Gamma/\pi a$
4. $\sqrt{2}\Gamma/a$

Question Number : 94 Question Id : 7621615254 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The statement that "The airfoil generates sufficient circulation to depress the rear stagnation point from its position, in the absence of circulation , down to the sharp trailing edge" is known as

(I) Kutta condition

(II) Joukowski postulation

(III) Kutta- Joukowski theorem

Which of the above statements is/are correct?

Options :

1. I only
2. I and II
3. II and III
4. I and III

Question Number : 95 Question Id : 7621615255 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The semi-span of a rectangular wing of planform area 8.4 m^2 is 3.5 m. The aspect ratio of the wing is

Options :

1. $5.83\ m^2$
2. $11.66\ m^2$
3. $2.92\ m^2$
4. $0.17\ m^2$

Question Number : 96 Question Id : 7621615256 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In comparison to combustion chamber, the temperature rise in afterburner

Options :

1. is low
2. is equal
3. is high
4. Cannot be compared

Question Number : 97 Question Id : 7621615257 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about afterburners.

(I) Afterburners are not equipped with case and liners.

(II) Use of afterburners increases the efficiency.

(III) Engines with afterburners consume lower amounts of fuel.

Which of the above statements is/are correct/incorrect?

Options :

1. I and II are correct
2. II only is correct
3. II and III are correct
4. I, II and III are incorrect

Question Number : 98 Question Id : 7621615258 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Mixture of liquid hydrogen and liquid oxygen may produce the thrust up to _____

Options :

1. 1.5 km/s
2. 4 km/s
3. 4.5 km/s
4. 5 km/s

Question Number : 99 Question Id : 7621615259 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about cryogenic rocket engines.

(I) Pyrotechnic initiators are used in cryogenic rocket engines.

(II) Cryogenic fuels are stored at room temperature and pressure.

(III) Cryogenic rocket engines are also called as hybrid rocket engines.

Which of the above statements is/are CORRECT?

Options :

1. I and III
2. I only
3. II and III
4. III only

Question Number : 100 Question Id : 7621615260 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In centrifugal compressors, the flow sometimes leaves the impeller at Mach number _____

Options :

1. $M \approx 2$
2. $M \approx 2.5$
3. $M \approx 1$
4. $M \approx 1.5$

Question Number : 101 Question Id : 7621615261 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statements is CORRECT?

Options :

1. In transonic flow, the density change is faster than the velocity change.
2. The density change in supersonic flow is slower than the velocity change.
3. Mach number downstream of an oblique shock wave is always subsonic.
4. In Hot-Wire Anemometry, the hot wire sensor is generally made of Tungsten.

Question Number : 102 Question Id : 7621615262 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In an aircraft wing if the incidence from root to tip is decreased, it is known as _____

Options :

1. Downwash
2. Washout
3. Slush

4. Slosh

Question Number : 103 Question Id : 7621615263 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

A sailplane with a glide ratio of 12 is flying 2400 m above the ground. The greatest distance it can travel in still air will be

Options :

1. 14,400 m
2. 28,800 m
3. 200 m
4. 100 m

Question Number : 104 Question Id : 7621615264 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If the pitot tube becomes clogged, then which of the following parameters can't be computed?

Options :

1. Airspeed
2. Vertical speed
3. Altitude
4. Outside air temperature

Question Number : 105 Question Id : 7621615265 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following atmospheric conditions will lead to longer takeoff and lower rate of climb?

Options :

1. High Temperature, High Relative Humidity, and High Altitude
2. High Temperature, Low Relative Humidity, and Low Altitude
3. Low Temperature, Low Relative Humidity, and Low Altitude
4. High Temperature, Low Relative Humidity, and High Altitude

Question Number : 106 Question Id : 7621615266 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In a straight level flight, for a wing of elliptic loading, the condition for minimum drag is

Options :

1. $C_{D0} = kC_L^3$
2. $C_{D0} = kC_L^{2/3}$
3. $C_{D0} = kC_L^{3/2}$

4. $C_{D0} = kC_L^2$

Question Number : 107 Question Id : 7621615267 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Air flows from a reservoir through a convergent-divergent nozzle at low subsonic speed and is exhausted into the atmosphere. A pitot tube is mounted at the mid-section of the nozzle and traversed along the length of the nozzle from exit to the reservoir end. The pressure recorded by the pitot tube will

Options :

1. Increase during traverse
2. Decrease during traverse
3. Decrease up to the throat and then increase during traverse
4. Remain constant during traverse

Question Number : 108 Question Id : 7621615268 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For the same test-section speed and flow rate, the efficiency of a closed circuit low speed wind tunnel is

Options :

1. Greater than that of an open circuit wind tunnel
2. Less than that of an open circuit wind tunnel
3. Equal to that of an open circuit wind tunnel
4. Not comparable with that of an open circuit tunnel because of design differences

Question Number : 109 Question Id : 7621615269 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The schlieren technique works on the basis of

Options :

1. Density variation in the flow field
2. Pressure variation in the flow field
3. Velocity variation in the flow field
4. Density gradient variation in the flow field

Question Number : 110 Question Id : 7621615270 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

If the Reynolds number in a boundary layer flow decreases then

Options :

1. Mach number increases

2. Pressure gradient normal to body surface decreases

3. Boundary layer thickness increases

4. Boundary layer thickness decreases

Question Number : 111 Question Id : 7621615271 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

For a supercritical airfoil, which of the following statement is correct?

Options :

1. It has higher wave drag

2. It has higher critical Reynolds number

3. It greatly reduces shock-induced boundary layer separation

4. It has lower drag divergence Mach number

Question Number : 112 Question Id : 7621615272 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

When a moving fluid is brought to rest adiabatically, then which of the following statement is CORRECT?

Options :

1. Both stagnation pressure and stagnation temperature are conserved.

2. Stagnation pressure is not conserved but stagnation temperature is conserved.

3. Stagnation pressure is conserved but stagnation temperature is not conserved.

4. Both stagnation pressure and stagnation temperature are not conserved.

Question Number : 113 Question Id : 7621615273 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statements is CORRECT about steady flow?

Options :

1. It occurs when pressure does not change along the flow.

2. It occurs when conditions do not change with time at any point.

3. It occurs when velocity does not change.

4. It occurs when conditions change gradually with time.

Question Number : 114 Question Id : 7621615274 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

The mixing length model was first proposed by

Options :

1. Ludwig Prandtl

2. Theodore von-Karman

3. Albert Einstein

4. Isaac Newton

Question Number : 115 Question Id : 7621615275 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements about the boundary layer flow.

(I) The flow field outside the boundary layer is rotational.

(II) The pressure inside the boundary layer is equal to that of outside flow.

(III) The skin friction coefficient of laminar boundary layer is more than the turbulent boundary layer.

Which of the above statements is/are CORRECT?

Options :

1. I and II both

2. II only

3. III only

4. I, II and III

Question Number : 116 Question Id : 7621615276 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following statements is CORRECT?

Options :

1. The jet velocity in turbofan engine is less than that of turbojet engine.

2. Fighter bombers use turbo-prop engine.

3. Adding ammonia and water vapor in compressor decreases the effective power output of turbine.

4. Trim tabs are used for the same purpose as hydraulic actuators.

Question Number : 117 Question Id : 7621615277 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

In centrifugal pumps, to obtain higher flow output the impellers

Options :

1. can be connected in series only

2. can be connected in parallel only

3. can be connected either in series or in parallel

4. cannot be connected

Question Number : 118 Question Id : 7621615278 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Consider the following statements.

(I) Perfectly straight column and axial load apply.

(II) Length of column is large as compared to its cross-sectional dimensions.

(III) The shortening of column due to direct compression is not neglected.

(IV) The failure of column occurs due to buckling alone.

Which of the above statements are taken as assumptions in Euler's Column Theory?

Options :

1. I, II and III
2. I, II and IV
3. II, III and IV
4. III and IV

Question Number : 119 Question Id : 7621615279 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Airy stress function satisfies which of the following equation?

Options :

1. $\nabla^2\phi = 0$
2. $\nabla^2\phi = g(x)$
3. $\nabla^3\phi = 0$
4. $\nabla^4\phi = 0$

Question Number : 120 Question Id : 7621615280 Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Which of the following is an incorrect statement?

Options :

1. Both heat and work may cross the sytem boundary.
2. Both heat and work are path functions.
3. Both heat and work are properties of the system.
4. Heat flows when the system and surrounding are not in equilibrium which is not necessary for work.