

National Testing Agency

Question Paper Name: Engineering Mechanics
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Duration: 180
Total Marks: 100
Display Marks: Yes

Engineering Mechanics

Group Number : 1
Group Id : 90958254
Group Maximum Duration : 0
Group Minimum Duration : 120
Revisit allowed for view? : No
Revisit allowed for edit? : No
Break time: 0
Group Marks: 100

Engineering Mechanics

Section Id : 90958254
Section Number : 1
Section type : Online
Mandatory or Optional: Mandatory
Number of Questions: 100
Number of Questions to be attempted: 100
Section Marks: 100
Display Number Panel: Yes
Group All Questions: No

Sub-Section Number: 1
Sub-Section Id: 90958257
Question Shuffling Allowed : Yes

Question Number : 1 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A combination of large number of particles in which all particles remain at a fixed distance from another before and after applying a load is called

- a) centre of mass
- b) rigid body
- c) continuum
- d) center of gravity

Options :

1. A
2. B
3. C
4. D

Question Number : 2 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Force acts along its line of action and makes no change if it acts from different point on its line of action on rigid body. This is the statement of

- a) Law of transmissibility of force
- b) Law of parallelogram of force
- c) Varignon's theorem
- d) Lami's theorem

Options :

1. A
2. B
3. C
4. D

Question Number : 3 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The process of representing the physical action in form of equations by hypothetical and highly simplified substitutions is called

- a) modeling
- b) idealization
- c) computational technique
- d) analysis

Options :

1. A
2. B
3. C
4. D

Question Number : 4 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Size of earth is insignificant compared to the size of its orbit. Hence earth can be modelled as a

- a) rigid body
- b) particle
- c) continuum
- d) sphere

Options :

1. A
2. B
3. C
4. D

Question Number : 5 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The subject that is concerned with the accelerated motion of rigid bodies is called

- a) Solid mechanics
- b) Classical mechanics
- c) Statics
- d) Dynamics

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 6 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The study of a body in motion, when the forces which cause the motion is considered is called

- (a) Statics
- (b) Dynamics
- (c) Kinetics
- (d) Kinematics

Options :

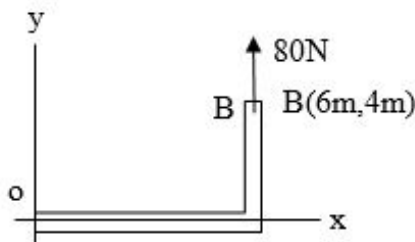
- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 7 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The moment of the 80N force about origin O is

- (a) 320 N-m clockwise
- (b) 480 N-m counter clockwise
- (c) 600 N-m clockwise
- (d) 600 N-m counter clockwise



Options :

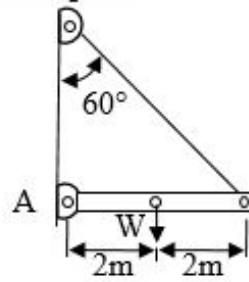
- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 8 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The weight $W=1.2$ kN. The sum of the moments about A due to W and the force exerted at the end of the bar by the rope is zero. The tension in the rope is

- a) 3.6 kN
- b) 2.4 kN
- c) 1.2 kN
- d) 0.6 kN



Options :

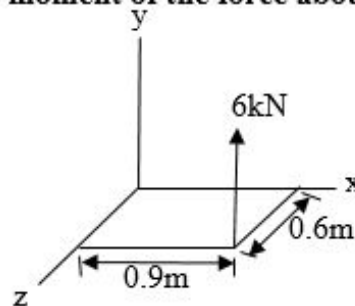
- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 9 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A force of 6kN is applied parallel to y axis. The moment of the force about x axis.

- a) +3.6 kN-m
- b) -3.6 kN-m
- c) +5.4 kN-m
- d) -5.4 kN-m



Options :

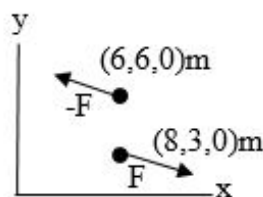
- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

The force F in figure is $10i-4j$ (N). The moment of the couple is

- (a) $32k$ (N-m)
- (b) $-32k$ (N-m)
- (c) $22k$ (N-m)
- (d) $-22k$ (N-m)



Options :

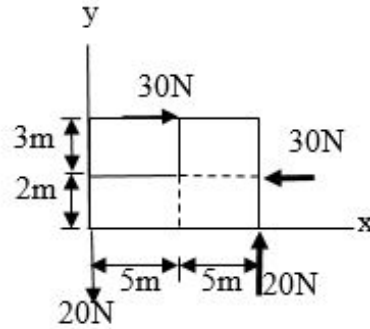
- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

If k is the unit vector along z axis. The sum of the moments exerted on the plate by the two couples is

- (a) $-90k(N\cdot m)$
- (b) $+90k(N\cdot m)$
- (c) $+270k(N\cdot m)$
- (d) $-270k(N\cdot m)$



Options :

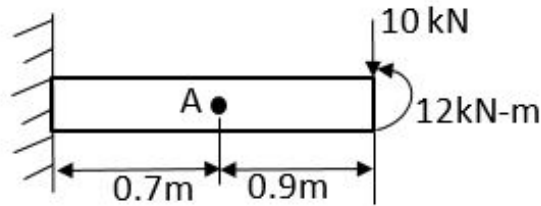
- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 12 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A force and couple acting at the end of a beam. If i, j, k are the unit vectors along x, y and z axis then an equivalent force and couple at point A are

- a) $+10j(kN), 3k(kN\cdot m)$
- b) $+10j(kN), -3k(kN\cdot m)$
- c) $-10j(kN), -3k(kN\cdot m)$
- d) $-10j(kN), 3k(kN\cdot m)$



Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

The dimensional formula for power is

- a) ML^2T^2
- b) ML^2T^{-2}
- c) ML^2T^3
- d) ML^2T^{-3}

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 14 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Two systems of forces and moments are equivalent if in two systems the sum of the

- a) Forces and moments are equal
- b) Forces are equal
- c) Moments are equal
- d) None of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 15 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A force F and a couple M_p is called a wrench if

- a) M_p is parallel to F
- b) M_p is normal to F
- c) M_p has components both parallel and normal to F
- d) None of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 16 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Gravitational force acting on a body is called

- a) mass
- b) moment of inertia
- c) weight
- d) None of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 17 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

An airplane has mass of 250,000 kg. The thrust force of the engines is 700kN. The airplane's acceleration is

- a) 9.81 m/s^2
- b) 2.8 m/s^2
- c) 1.4 m/s^2
- d) 3.5 m/s^2

Options :

1. A
2. B
3. C
4. D

Question Number : 18 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A flywheel of mass 7500 kg and radius of gyration 0.7 m gains a speed of 200 rpm from rest in 3 minutes. The average torque exerted on it is

- a) 425.5 N-m
- b) 450.4 N-m
- c) 427.5 N-m
- d) 427.6 N-m

Options :

1. A
2. B
3. C
4. D

Question Number : 19 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A gear of 90 mm dia can turn freely on pin support. The moment of inertia of the gear about its centre of mass is 0.002 kg-m^2 . A constant couple of 2 N-m is applied to the gear then the angular acceleration is

- a) 100 rad/s^2
- b) 1000 rad/s^2
- c) 0.004 rad/s^2
- d) 0.001 rad/s^2

Options :

1. A
2. B
3. C
4. D

Question Number : 20 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A thin circular ring of mass M and radius R is rotating about its axis with a constant angular velocity ω . Two objects each of mass m are attached gently to the ring. The wheel now rotates with an angular velocity

- a) $\frac{\omega M}{(m+M)}$
- b) $\frac{\omega(M-2m)}{(M+2m)}$
- c) $\frac{\omega M}{(M+2m)}$
- d) $\frac{\omega(M+2m)}{M}$

Options :

1. A
2. B
3. C
4. D

Question Number : 21 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A body of mass 15 kg moving over a smooth surface whose equation of motion is given by the relation $S = 15t + 3t^2$. Where S is the distance in meter and t is the time in seconds. The magnitude of the force responsible for the motion is

- a) 60 N
- b) 90 N
- c) 45 N
- d) 225 N

Options :

1. A
2. B
3. C
4. D

Question Number : 22 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The resultant force in each coordinate direction is applied to the total mass as if the rigid body are a particle and there is no rotation of the body. This type of motion of rigid body is termed as

- a) Pure rotation about centre of mass
- b) Pure translation
- c) Unconstrained motion
- d) None of the above

Options :

1. A
2. B
3. C
4. D

Question Number : 23 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In case of a given system of parallel forces applied to given points in a rigid body there is only one point called

- a) centre of mass
- b) centre of gravity
- c) centre of parallel forces
- d) none of the above

Options :

1. A

2. B
3. C
4. D

Question Number : 24 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The sum of the external forces acting on the body is equal to the body's mass times the acceleration of its mass centre. This is the statement of

- a) translational equation of motion
- b) rotational equation of motion
- c) equations of general planar of motion
- d) none of the above.

Options :

1. A
2. B
3. C
4. D

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

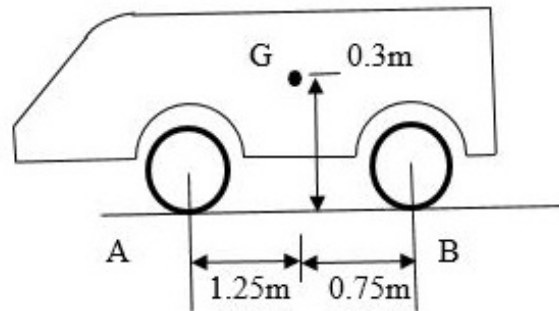
Correct Marks : 1 Wrong Marks : 0

A car has a mass of 2000 kg and centre of mass is at G. Neglect the mass of the wheel.

The coefficient of kinetic friction between the wheels and the road is $\mu_k = 0.25$

The front wheels freely rotate and the driving wheels in the back always slip. The car's acceleration is

- a) 1.25 m/s^2
- b) 1.59 m/s^2
- c) 0.75 m/s^2
- d) 0.25 m/s^2



Options :

1. A
2. B
3. C
4. D

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

Correct Marks : 1 Wrong Marks : 0

A vector quantity can be described by

- a) magnitude with proper unit
- b) magnitude only
- c) magnitude and direction
- d) magnitude, direction and orientation

Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

Displacement is a

- a) Vector Quantity
- b) Scalar Quantity
- c) Both
- d) None

Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

Statement 1: A sliding vector is one for which a unique line in space must be maintained along which the quantity acts.

Statement 2: A fixed vector doesn't occupy a particular position in space.

Choose the right option:

- a) Statement 1 is true
- b) Statement 2 is true
- c) Both of the statements are true
- d) None of the statements is true.

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 29 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A unit vector

- a) has a dimension
- b) is dimensionless
- c) either a or b
- d) none of them

Options :

1. A
2. B
3. C
4. D

Question Number : 30 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A vector of magnitude 50N at xy plane makes an angle 30° with x axis, can be expressed in Cartesian vector form as

- a) $50i + 50j$
- b) $40i + 60j$
- c) $43.3i + 25j$
- d) $25i + 43.3j$

Options :

1. A
2. B
3. C
4. D

Question Number : 31 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The magnitude of a vector quantity is

- (a) the dot product of the vector with itself
- (b) the cross product of the vector with unit vector along itself
- (c) the dot product of the vector with unit vector along itself
- (d) the cross product of the vector with itself

Options :

1. A
2. B
3. C
4. D

Question Number : 32 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Two vectors A and B are given by $(2i + 3j + 4k)$ and $(4i + 3j + 2k)$, then $\vec{A} \cdot \vec{B}$ is given by

- (a) 25
- (b) 18
- (c) $(6i + 6j + 6k)$
- (d) $(8i + 9j + 8k)$

Options :

1. A
2. B
3. C
4. D

Question Number : 33 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Total moment of various forces acting on the body

- a) is the vector sum of all moments
- b) is the algebraic sum of all moments
- c) is always zero
- d) is the vector sum of all moments which is perpendicular to each other forces

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 34 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

concurrent forces are those forces whose line of action

- a) lies on the same line
- b) meet at one point
- c) meet on the same plane
- d) none of these

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 35 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A rigid body is acted upon by a force system. It can in general be brought to equilibrium by the application of a force acting

- (a) on a suitable point on the body
- (b) anywhere along a suitable line
- (c) along a suitable line and a moment along the direction of the force
- (d) along a suitable line and a moment in the direction perpendicular to the direction; of force

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 36 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A rigid body is in equilibrium under the action of three forces. It implies that the force must

- a) be concurrent
- b) be coplanar
- c) either be concurrent or coplanar
- d) pass through the center of mass

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 37 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The necessary and sufficient condition of equilibrium for two dimensional force systems is

- a) $\sum F_x=0$ and $\sum F_y=0$
- b) $\sum M_o=0$
- c) Both a and b
- d) None of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

In the method of sections for the analysis of forces in the members of a pin-jointed, truss.

- (a) the section can be cut through any set of members for equal ease of analysis
- (b) the sections must be cut so that the number of unknowns is limited and determined by employing the conditions of equilibrium.
- (c) care must be taken to ensure that the section being cut is in equilibrium
- (d) the sections to be cut are as small as possible

Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

Statically indeterminacy means

- a) There will be less equations available for equilibrium than the unknown loadings
- b) There will be more equations available for equilibrium than the unknown loadings
- c) There will be equal equations available for equilibrium as the unknown loadings
- d) The support reactions are opposite to each other

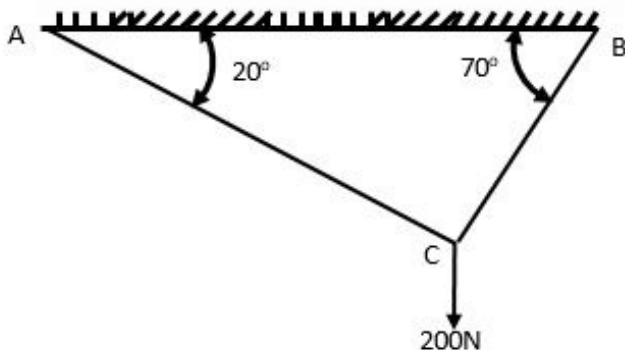
Options :

1. A
2. B
3. C
4. D

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

Correct Marks : 1 Wrong Marks : 0

A weight of 200kN is supported by two cables AC and CB of length 4m and 3m as shown in the figure below.



The tension in the cables AC and CB are given by

- (a) 59.6N, 171.7N
- (b) 62.4N, 176.8N
- (c) 62.5N, 182.7N
- (d) 68.4N, 187.9N

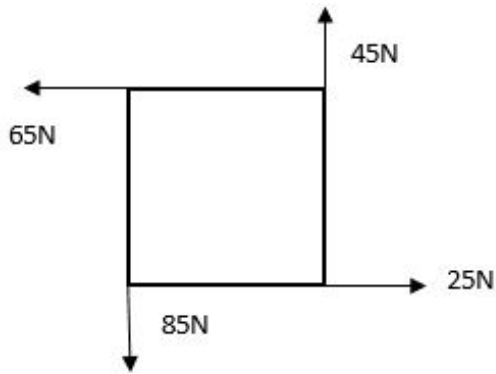
Options :

1. A
2. B
3. C
4. D

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

Correct Marks : 1 Wrong Marks : 0

Four forces of magnitude 25N, 45N, 65N and 85N are acting respectively along four sides of a square ABCD as shown in the figure below.



The magnitude of the resultant is given by

- (a) $40\sqrt{2}\text{N}$
- (b) $60\sqrt{2}\text{N}$
- (c) $45\sqrt{2}\text{N}$
- (d) $60\sqrt{2}\text{N}$

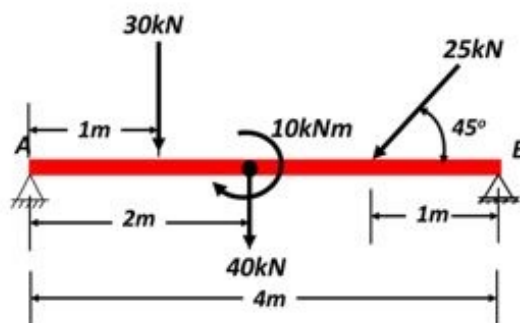
Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 42 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A beam is loaded as in the figure below.



The horizontal and vertical support reactions at support A are given by

- (a) 20kN, 50kN
- (b) 16.72kN, 46.72kN
- (c) 17.72kN, 44.72kN
- (d) 44.72kN, 17.72kN

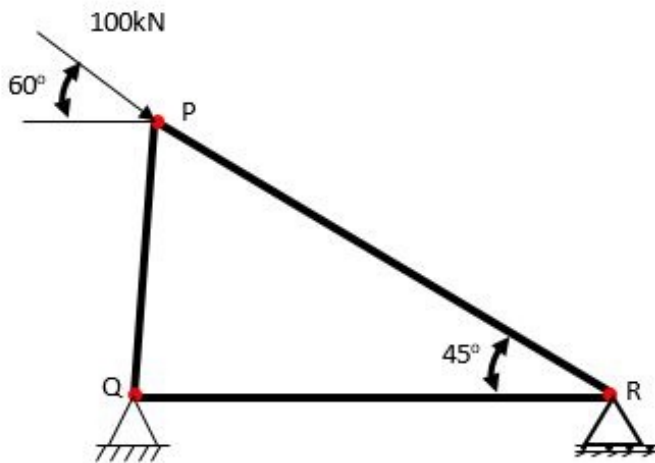
Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

For the truss, shown in the figure below, the magnitude of the force in member PR and support reaction at R, are respectively



- (a) 122.47kN and 50kN
- (b) 70.77kN and 100kN
- (c) 107.47kN and 60kN
- (d) 81.65kN and 100kN

Options :

- 1. A
- 2. B
- 3. C
- 4. D

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

Correct Marks : 1 Wrong Marks : 0

The centroid of a plane area is

- a) dependent on axis of reference employed
- b) always inside the area
- c) independent of axis of reference employed
- d) None of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 45 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The centroidal axis

- (a) may not pass through centroid
- (b) must pass through centroid
- (c) always lie at the geometric centre
- (d) all of the above
- (e) none of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 46 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Centroid of an annular area having external and internal radius r_1 and r_2 respectively, lie at

- (a) $(r_1 - r_2)/2$ from the centre
- (b) $(r_1 + r_2)/4$ from the centre
- (c) outside the ring area
- (d) at centre

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 47 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The centre of gravity of a solid hemisphere lies on the central radius

- (a) at distance $3r/2$ from the plane base
- (b) at distance $3r/4$ from the plane base
- (c) at distance $3r/5$ from the plane base
- (d) at distance $3r/8$ from the plane base

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 48 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The C.G. of an isocoles triangle with base b and other sides a lies at following distance from the base

- (a) $\sqrt{(a^2 - b^2)}/6$
- (b) $\sqrt{(2a^2 - b^2)}/6$
- (c) $\sqrt{(a^2 - 2b^2)}/6$
- (d) $\sqrt{(4a^2 - b^2)}/6$

Options :

1. A
2. B
3. C
4. D

Question Number : 49 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The location of the C.G of a solid hemisphere of radius 40 cm is at -----from base

- (a) 20 cm
- (b) 12 cm
- (c) 15 cm
- (d) 10 cm

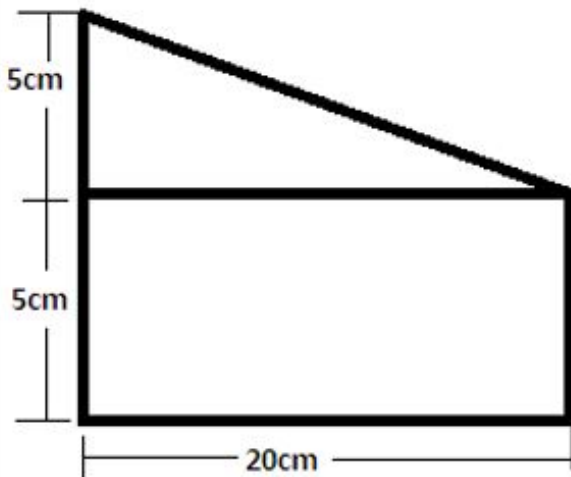
Options :

1. A
2. B
3. C
4. D

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

Correct Marks : 1 Wrong Marks : 0

The centroid of the composite area as in the figure below lie at



- (a) (10,5)
- (b) (8.5, 4.2)
- (c) (8.89,3.89)
- (d) (7.59,4.29)

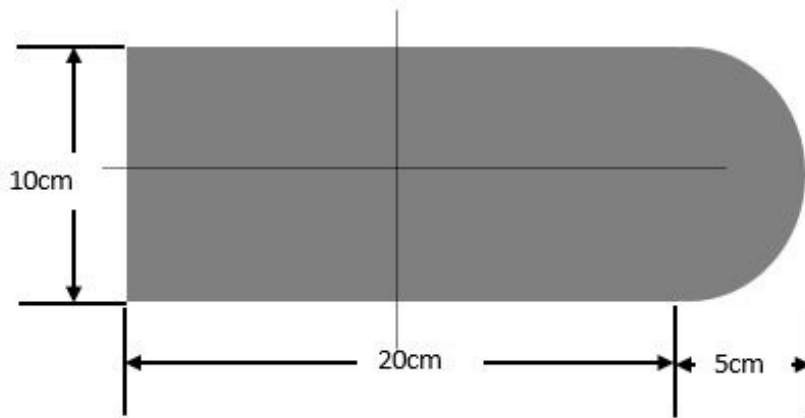
Options :

1. A
2. B
3. C
4. D

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

Correct Marks : 1 Wrong Marks : 0

The centroid of the composite area as in the figure below lie at



- (a) (10,5.2)
- (b) (11.98,5)
- (c) (12.98, 4)
- (d) (12.98,5)

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 52 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Moment of inertia is

- (a) independent of reference axes
- (b) dependent only on the shape of the area
- (c) dependent on shape as well as reference axes
- (d) All the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 53 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Moment of inertia of a rectangular area of base b and height d about the centroidal x-axis is given by

- (a) $bd^3/3$
- (b) $bd^3/4$
- (c) $bd^3/6$
- (d) $bd^3/12$

Options :

1. A
2. B
3. C
4. D

Question Number : 54 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The moment of inertia of a rectangular section of base 'b' and height 'h' about an axis passing through its base is times the moment of inertia about an axis passing through its centroid and parallel to the base

- (a) 9
- (b) 4
- (c) 3
- (d) 2

Options :

1. A
2. B
3. C
4. D

Question Number : 55 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The ratio of moment of inertia of a rectangle and that of a triangle having same base and height about their bases is

- (a) 1
- (b) 2.5
- (c) 4
- (d) 6

Options :

1. A
2. B
3. C
4. D

Question Number : 56 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The product of inertia about an axis of symmetry is

- (a) always positive
- (b) always negative
- (c) may or may not be zero
- (d) Zero

Options :

1. A
2. B
3. C

4. D

Question Number : 57 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Moment of inertia of a semi-circular area of diameter 100mm about centroidal x axis is given by

- (a) $2.86 \times 10^5 \text{ mm}^4$
- (b) $9.86 \times 10^5 \text{ mm}^4$
- (c) $6.86 \times 10^5 \text{ mm}^4$
- (d) $1.86 \times 10^5 \text{ mm}^4$

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 58 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

$I_{\text{about any axis}} = I_{\text{about a parallel axis at centroid}}$

- (a) $- Ad^2$
- (b) $- Ad$
- (c) $+ Ad^2$
- (d) $+ Ad$

Where, d is the distance between the axes

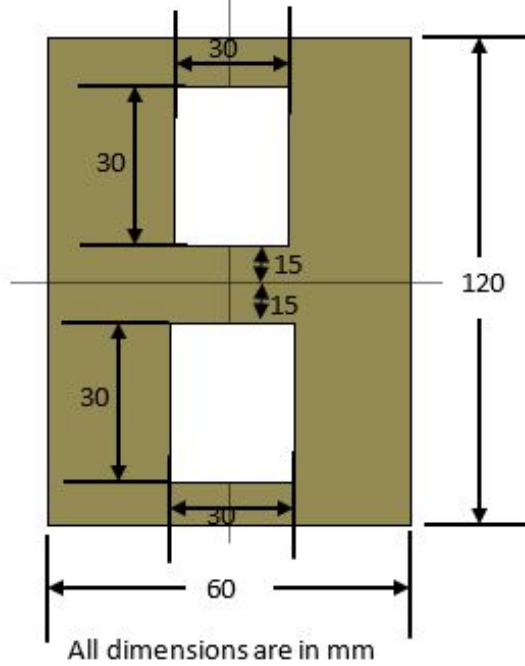
Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 59 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The value of moment of inertia of the colored area as shown in the figure below about XX axis is



- (a) $8.5050 \times 10^6 \text{mm}^4$
- (b) $6.8850 \times 10^6 \text{mm}^4$
- (c) $7.7625 \times 10^6 \text{mm}^4$
- (d) $8.5725 \times 10^6 \text{mm}^4$

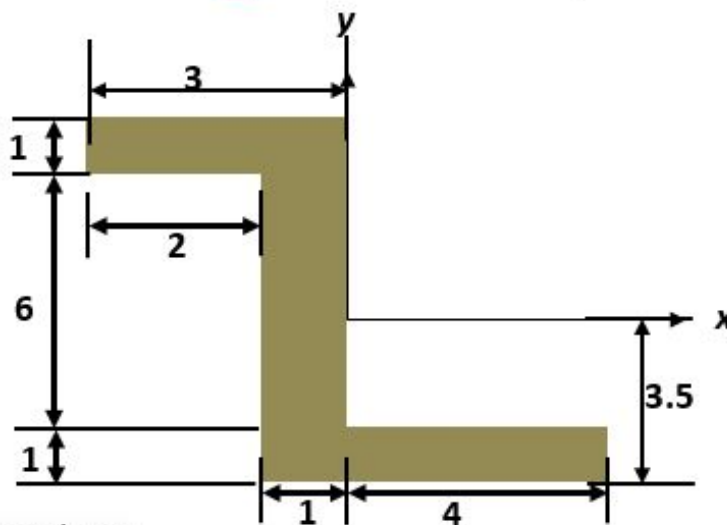
Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 60 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

60. The product of inertia about the xy axis as shown in the figure below is



- (a) 52cm^4
- (b) -42cm^4
- (c) -52cm^4
- (d) 42cm^4

Options :

1. A
2. B
3. C
4. D

Question Number : 61 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The reason for a Boat or an Aeroplane having pointed or tapering front /head is

- a) To increase the friction of the fluid
- b) To reduce the friction of fluid
- c) To look good
- d) For no reason

Options :

1. A
2. B
3. C
4. D

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

Correct Marks : 1 Wrong Marks : 0

An object is in motion in a horizontal plane. The force of friction acts in a direction _____ to the direction of motion of object.

- a) Same
- b) opposite
- c) Perpendicular
- d) Downwards

Options :

1. A
2. B
3. C
4. D

Question Number : 63 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The ratio of the limiting force of friction (F) to the normal reaction (R) is known as

- a. Coefficient of friction
- b. Force of friction
- c. Angle of friction
- d. None of the above

Options :

1. A
2. B
3. C
4. D

Question Number : 64 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The normal force exerted by the surface of the wedge is normal to the surface of the

- _____
- a) Base of the wedge
 - b) Base of the body residing over it
 - c) Base of the body just neighbor to the wedge
 - d) Earth's surface

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 65 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A block weighing 200N is in contact with a level plane whose coefficients of static and kinetic friction are 0.4 and 0.2 respectively. The block is acted upon by a horizontal force (in N) $P = 10t$ where t denotes the time in seconds. The velocity (in m/s) of the block attained by after 10s is

_____.

- a) 2.9
- b) 3.9
- c) 4.9
- d) 5.9

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 66 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A block of mass 10 kg is placed on a rough horizontal surface having coefficient of friction = 0.5. If a horizontal force of 100 N is applied on it, then the acceleration of the block will be

- (a) 15 m/s^2
- (b) 10 m/s^2
- (c) 5 m/s^2
- (d) 0.5 m/s^2

Options :

- 1. A
- 2. B
- 3. C

4. D

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

Correct Marks : 1 Wrong Marks : 0

The approximate value of coefficient of static friction for dry surfaces (metal on wood) is

- a) 0.15-0.6
- b) 0.2-0.6
- c) 0.3-0.7
- d) 0.3-0.6

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 68 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The reaction forces and other internal constraining forces which do not contribute to the ----- need not to be evaluated while dealing with static structures.

- a) Conservative work b) Virtual work c) Non conservative work d) none of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 69 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a system of connected bodies the number of independent virtual displacements = the ----- number of independent coordinates needed to specify completely the location of all members of the system.

- a) maximum b) minimum c) least d) peak

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 70 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In real machine ----- forces will always do some work, then output work will be less than input work

- a) gravity b) friction c) abrasive d) none of the above

Options :

1. A
2. B
3. C
4. D

Question Number : 71 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

It has been observed that the potential energy concept can be useful if a system is operated under the action of ----- forces.

- a) conventional b) traditional c) conservative d) non conservative

Options :

1. A
2. B
3. C
4. D

Question Number : 72 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The state of equilibrium of a Homogeneous Cylinder is constant if the potential energy of it is

- a) maximum b) minimum c) neutral d) none of the above

Options :

1. A
2. B
3. C
4. D

Question Number : 73 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The position of a point is specified by -----vector directed from the origin of the reference frame to the point.

- a) velocity b) acceleration c) position d) location

Options :

1. A
2. B
3. C
4. D

Question Number : 74 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A rigid body experiences -----if the linear displacement of its every point is the same.

a) rotation b) plane motion c) translation d) none of the above

Options :

1. A
2. B
3. C
4. D

Question Number : 75 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For kinematics of rigid body in considering several frames of references, if one of the frames is attached to the earth, is called a -----frame of reference.

a) movable b) transferable c) convertible d) fixed

Options :

1. A
2. B
3. C
4. D

Question Number : 76 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

. The body may be considered to be in pure rotation in a circular path about the ----- --axis of zero velocity.

a) fixed b) movable c) direct d) instantaneous

Options :

1. A
2. B
3. C
4. D

Question Number : 77 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A truck driving along a highway road has a large quantity of momentum. If it moves at the same speed but has twice as much mass, its momentum is _____

- a) zero
- b) quadrupled
- c) doubled
- d) unchanged

Options :

1. A
2. B
3. C
4. D

Question Number : 78 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

For a system of particles -----force is the resultant of all the forces that the other particles exert on ith particle.

- a. external
- b. internal
- c) neutral
- d) Gravitational

Options :

1. A
2. B
3. C
4. D

Question Number : 79 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The principle of work and Energy states that the particle's initial kinetic energy plus the work done by all the forces acting on the particle as it moves from its initial to its final positon is equal to the particle's final -----energy.

- a) potential
- b) kinetic
- c) gravitational
- d)none of the above

Options :

1. A
2. B
3. C
4. D

Question Number : 80 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Figure 1 shows a wheel rotating about O. Two points A and B located along the radius of the wheel have speeds of 80 m/s and 140 m/s respectively. The distance between the points A and B is 300 mm. The diameter of the wheel -----

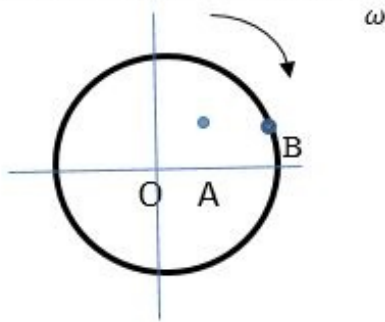


Fig.1

- a) 1200 mm b) 1300 mm c) 1400 mm d) 1600 mm

Options :

1. A
2. B
3. C
4. D

Question Number : 81 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The momentum of a system of two bodies is conserved

- a) If either body does not exert a force on the other
- b) under all circumstance
- c) when there is no external force acting on either body
- d) when there is external force acting on either body

Options :

1. A
2. B
3. C
4. D

Question Number : 82 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The principle of conservation of mechanical energy requires that

- a) the acceleration should be zero
- b) the motion should be restricted to the gravitational field only
- c) the force-field should be conservative

Options :

1. A
2. B
3. C
4. D

Question Number : 83 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The main condition for the rigid body is that the distance between various particles of the body does -----

- a) change
- b) does not change
- c) Initially change then fixed
- d) none of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 84 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If two objects of 30 kg and 10 kg move with equal kinetic energy, then what is the ratio of magnitudes for linear momentum?

- a. $\sqrt{3}: 1$
- b. $1: \sqrt{3}$
- c. $1: 3\sqrt{3}$
- d. $1: 3$

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 85 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If a particle of mass 5 kg moves uniformly along a circle of radius 10 m at 10 m/s, then what is the work done by centripetal force during its one revolution?

- a. 0.5 kNm
- b. zero
- c. infinity
- d. none of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 86 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A particle moving with respect to fixed frame of reference is called as

- a. absolute motion
- b. relative motion
- c. rectilinear motion
- d. none of the above

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 87 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Which of the following factors are related by work energy principle?

- a. force, displacement and time
- b. force, velocity, time and mass
- c. force, velocity, displacement
- d. displacement, time and mass

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 88 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

Kinetic friction is the

- (a) tangent of angle between normal reaction and the resultant of normal reaction and the limiting friction
- (b) ratio of limiting friction and normal reaction
- (c) the friction force acting when the body is just about to move
- (d) the friction force acting when the body is in motion
- (e) dynamic friction.

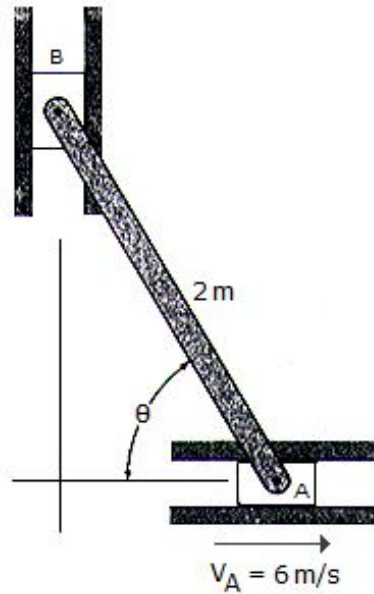
Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 89 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The 2-m-long bar is confined to move in the horizontal and vertical slots A and B . If the velocity of the slider block at A is 6 m/s, determine the bar's angular velocity and the velocity of block B at the instant $\theta = 60^\circ$.



- a) $\omega_{AB} = 3.46 \text{ rad/s}$ ↻, $v_B = 3.46 \text{ m/s}$ ↑
- b) $\omega_{AB} = 3.00 \text{ rad/s}$ ↻, $v_B = 3.00 \text{ m/s}$ ↑
- c) $\omega_{AB} = 3.00 \text{ rad/s}$ ↻, $v_B = 6.00 \text{ m/s}$ ↑
- d) $\omega_{AB} = 6.00 \text{ rad/s}$ ↻, $v_B = 10.39 \text{ m/s}$ ↑

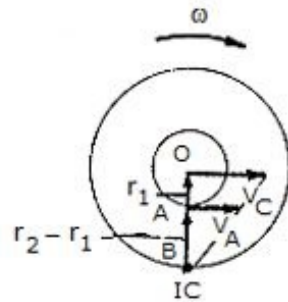
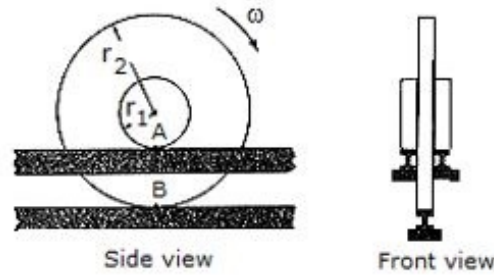
Options :

1. A
2. B
3. C
4. D

Question Number : 90 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

If the rim of the wheel and its hub maintain contact with the three stationary tracks as the wheel rolls, it is necessary that slipping occurs at the hub A if no slipping occurs at B . Under these conditions, what is the speed at A if the wheel has an angular velocity ω ?



- a) $v_A = (r_2 - r_1)\omega \leftarrow$
- b) $v_A = r_1 \omega \leftarrow$
- c) $v_A = (r_2 - r_1)\omega \rightarrow$
- d) $v_A = r_1 \omega \rightarrow$

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 91 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

The radius of curvature of trajectory for a profile is minimum, if _____

- a. velocity is minimum
- b. acceleration is maximum
- c. both a. and b.
- d. none of the above

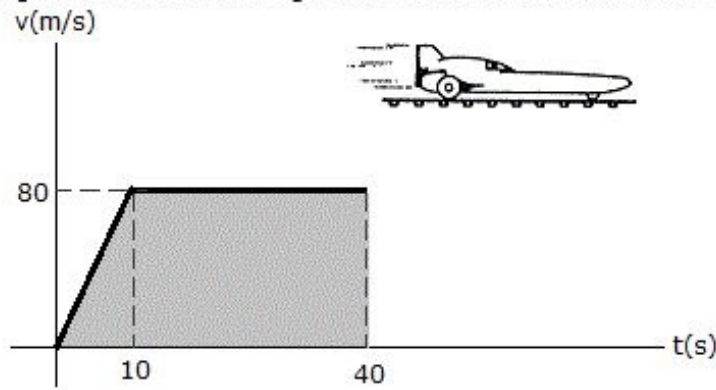
Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 92 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

From experimental data, the motion of a jet plane while traveling along a runway is defined by the v-t graph shown. Find the position s and the acceleration a when $t = 40$ s.



- a) $s = 2.80$ km, $a = 2.00$ m/s²
- b) $s = 2.80$ km, $a = 0$
- c) $s = 2.80$ km, $a = 2.67$ m/s²
- d) $s = 2.80$ km, $a = 8.37$ m/s²

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 93 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A particle is moving along a straight line through a fluid medium such that its speed is measured as $v = (2t)$ m/s, where t is in seconds. If it is released from rest at $s = 0$, determine its positions and acceleration when $t = 3$ s.

- a) $s = 9$ m, $a = 2$ m/s²
- b) $s = 2$ m, $a = 18$ m/s²
- c) $s = 18$ m, $a = 2$ m/s²
- d) $s = 2$ m, $a = 9$ m/s²

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 94 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A boat is traveling along a circular path having a radius of 20 m. Determine the magnitude of the boat's acceleration if at a given instant the boat's speed is $v = 5 \text{ m/s}$ and the rate of increase in speed is $v = 2 \text{ m/s}^2$.

- a) $a = 2.00 \text{ m/s}^2$
- b) $a = 2.36 \text{ m/s}^2$
- c) $a = 1.25 \text{ m/s}^2$
- d) $a = 12.50 \text{ m/s}^2$

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 95 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

In dryer, water is pushed out of wet clothes due to

- a) abundance of centripetal force
- b) lack of centripetal force
- c) friction
- d) retarding force

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 96 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A cyclist of mass 30 kg exerts a force of 250 N to move his cycle. acceleration is 4 ms^{-2} . force of friction between road and tyres will be

- a) 120 N
- b) 150 N
- c) 115 N
- d) 130 N

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 97 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

When a net force act on a body, it produces acceleration in body in direction of net force which is directly proportional to net force acting on body and inversely proportional to its mass. This statement is called

- a) Newton's 2nd law of motion
- b) Newton's 1st law of motion
- c) Newton's 3rd law of motion
- d) Law of momentum

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 98 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

How much centripetal force is needed to make a body of mass 0.8 kg to move in a circle of radius 40 cm with a speed 2 ms^{-1} ?

- a) 5 N
- b) 6 N
- c) 7 N
- d) 8 N

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 99 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A brick of mass 100 g is attached to a rope 1m long. brick is rotating in a circle with 5 ms^{-1} speed. tension in rope will be

- a) 3 N
- b) 2.5 N
- c) 4 N
- d) 1.5 N

Options :

- 1. A
- 2. B
- 3. C
- 4. D

Question Number : 100 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 1 Wrong Marks : 0

A train travels along a horizontal circular curve that has a radius of 200 m. If the speed of the train is uniformly increased from 30 km/h to 45 km/h in 5 s, determine the magnitude of the acceleration at the instant the speed of the train is 40 km/h.

- a) $a = 0.617 \text{ m/s}^2$
- b) $a = 1.037 \text{ m/s}^2$
- c) $a = 1.451 \text{ m/s}^2$
- d) $a = 0.833 \text{ m/s}^2$

Options :

- 1. A
- 2. B
- 3. C
- 4. D