ID#16413

Q1: Define Strain and a cord has original length of 100 cm is pulled by a force. The change in length of the cord is 2 mm. Determine the strain?

Answer:

Strain:

Strain is define as the amount of deformation in the direction of the applied force divided by the length of the material. when a material is loaded with a force, it produces stress, which can causes a material to deform.

Strain is define as extension per unit length.

Strain= extension/original length

$\varepsilon = e/lo$

Problem:

Given data:

Original length (lo) = 100 cm = 100/100 = 1 m

The change in length (Δl) =2 mm = 2/1000 = 0.002 m

Required:

Strain = ε = ?

Solution:

We know that

Strain = change in length (Δl)/ original length (lo)

Strain = 0.002/1

Strain= 0.002 m (answer)

Q2: If a tensile load of 5N is applied on a rectangular bar as shown in the figure. Where height of the bar is 8cm and breadth is 15cm. Calculate the tensile stress in the bar.

Answer:

Given:

Applied Load= F = 5N

Rectangular Bar dimensions:

Height= h= 8cm

h= 8 x 10^{-2} m

Breadth= b= 15cm

b=15 x 10^{-2}m

Required:

Stress in the bar= σ =?

Formula1:

σ = F/A

To find the stress first we will find the cross sectional area of the bar.

Formula 2:

A= b × h

= (8 x 10^{-2} m) x (15 x 10^{-2} m)

= 8 x 15 $(10^{-2})^{2}$ m^2

= 120 x 10^{-4} m^2

Stress= σ = F/ A

= 5N/ [120 x 10^{-4} m^2]

= (5 x 10^4) N/ 120m^2

= 416 N/m^2 (answer)

Q2 (b): If a compressive load of 10N is applied on a rectangular bar as shown in the figure. Where height of the bar is 8cm, breadth is 15cm and length 30cm. Calculate the compressive stress in the bar.

Answer:

Given:

Applied Load= F = 10N

Rectangular Bar dimensions:

Height= h= 8cm

h= 8 x 10^{-2} m

Breadth= b= 15cm

b=15 x 10^{-2} m

Length= L = 30cm

L=30 x 10^{-2} m

Required:

Stress in the bar= σ = ?

Solution:

Formula1:

σ= F/A

To find the stress first we will find the cross sectional area of the bar.

Formula 2:

$A = L\ x\ b$

=(30 x10^{-2} m) x (15 x 10^{-2} m)

= 30 x 15 $(10^{-2})^2$ m^2

= 450 x 10^{-4} m^2

Stress= σ = F/ A

= 10N/ [450 x 10^{-4} m^2]

= (10 x 10^4) N / 450m^2

= 222.22 N/m^2 (answer)

Q3 (a) Briefly explain principal of momentum and momentum of sea saw?

Answer:

Principle of momentum:

Momentum is defined as the product of mass and velocity. The unit for momentum is kilogram meters per second (kgm/s) and it is a vector quantity as it has both size and direction. The direction is given by the velocity (velocity = speed in a particular direction).

Momentum has the symbol “p” and can be written

mathematically as: p = m x v

Momentum of sea saw:

Both people exert a downward force on the seesaw due to their weights.

Person A's weight is trying to turn the seesaw anticlockwise whilst person B's weight is trying to turn the seesaw clockwise.

Person A's Moment = Force x perpendicular distance from fulcrum 1000 x 1 = 1000 Nm
Person B's Moment = Force x perpendicular distance from fulcrum 500 x 2 = 1000 Nm

Persons A's moment = Persons B's Moment
Anticlockwise moment=Clockwise moment

Q3 (b) Differentiate between stable and unstable Equilibrium and give proper examples you will Observe in daily life.

Answer:

Stable equilibrium

When the center of gravity of a body lies below point of suspension or support, the body is said to be in STABLE EQUILIBRIUM. For example a book lying on a table is in stable equilibrium.
A book lying on a horizontal surface is an example of stable equilibrium. If the book is lifted from one edge and then allowed to fall, it will come back to its original position.
Other examples of stable equilibrium are bodies lying on the floor such as chair, table etc.

Unstable equilibrium

When the center of gravity of a body lies above the point of suspension or support, the body is said to be in unstable equilibrium

pencil standing on its point or a stick in vertically standing position.

If thin rod standing vertically is slightly disturbed from its position it will not come back to its original position. This type of equilibrium is called unstable equilibrium, other example of unstable equilibrium are vertically standing cylinder and funnel etc. .

Q4: Define stress and following terms

- Tensile stress
- Compressive stress
- Shear Stress

Answer;

Stress:

Definition: " The Stress is defined as the resistance force per unit cross sectional area of the body". This internal resistance which the body offers to meet with the load is called stress**.**

Formula:

Stress = Resistance Force / Cross Sectional Area

$\sigma = F / A$

Tensile Stress:

Definition: "It is defined as the tensile force acting per unit cross sectional area of the member." Tensile stresses elongates the member

Formula:

Tensile Stress= Tensile Load /Cross-sectional Area

$\sigma t = Pt / A$

Compressive Stress:

Definition: It is defined as the compressive force per unit cross sectional area of the member..

Formula:

Compressive stress= Compressive load / Cross sectional Area

$\sigma c = Pc / A$

Shear Stress:

Definition: The shear force acting per unit cross sectional area of the body is called Shear stress.

Formula:

Shear stress= Shear load / Cross sectional Area

$\sigma s = Ps / A$