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Assignment: Basic mechanical technology
Module: 2nd B tech (E)
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Q1: Define strain and a cord has orignal length of 100cm is pulled by a force. The change in length of the cord is 2mm. Determine the strain?

Ans: **Definition:**

Strain is the relative change in shape or size of an object due to externally-applied forces.

The ratio of charge in a dimension that takes place with a material under stress.

Strain is a measurment of stress.

$$e = \frac{\Delta L}{L} = \frac{l - L}{L}$$

As we know that

-> cord orignal length = 100cm = L_o

-> The change in length = ΔL = 2mm

$$\frac{2mm}{1000} = 0.002m = 0.20cm$$

to find strain:-

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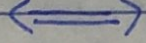
Sol:- As

Strain = $E = \frac{\Delta L}{Lo}$

ΔL change in length
and Lo orignal length

$\rightarrow E = \frac{\Delta L}{Lo} = \frac{0.2cm}{100cm}$

$(E = 0.002cm)$



Q2:(a) 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.

Ans:

As we know that

Given data :-

→ tensile load = P = 5N = F

→ height of the bar = 8cm = h = L

→ breadth = w = 15cm

Calculate:

Tensile stress

Sol:- As we know that

Tensile stress - $\sigma_T = \left[\frac{F}{A}\right]$

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where

-> F = 5N

-> Area of rectangle = L x W

$= 8 \times 15 = 120 cm^2$

Now $\sigma_T = \frac{5}{120}$

$\sigma_T = 0.04 N$

$(\sigma_T = 41.67 kN)$

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 30 cm. Calculate the compressive stress in the bar.

Ans:

Given data

Compressive load = P_b = 10N

height = 8cm

breadth = 15cm

length = 30 cm

to find compressive stress = ?

Sol:- As compressive stress = $\sigma_c = \left[\frac{P_b}{A}\right]$

Area = l x w x h

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Area = 8x15x30 = 3000

So compressive stress = $\frac{16}{3000\phi}$ =

$\delta c = 0.002$

$(\delta c = 2.7\ kN)$

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

Ans: **Principle of momentum:**

The principle of momentum state that when in equilibrium the total sum of the anti clock wise moment is equal to the total sum of the clock's wise momentum. when a system is stable or balance it is said to be in equilibrium as all the forces acting on the system cancel each other out.

Momentum conservation principle one of the most powerful laws in physics is the law of momentum conservation for a collision occuring between object 1 and object 2 in an isolated system, the total momentum of the two object before the collision is equal to the total momentum of the two objects after the collision.

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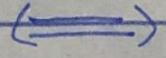
Momentum of seasaw:

= = Both the people exert a downward force on the seasaw due to their weight. Person A's weight is trying to turn the seasaw anticlockwise while person B's weight is trying to turn the seasaw clockwise



Q3:(b) Differentiate between stable and unstable Equilibrium and give proper example you will observe in daily life?

Ans:

The difference between stable and unstable equilibrium is in the slope of the line on the phase plot near the equilibrium point. stable equilibrium are characterized by a negative slope (negative feedback) whereas unstable equilibrium are characterized by a positive slope (positive feedback).

Example:-

A book lying on a flat table with its broad surface in

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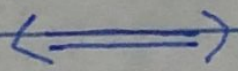
horizontal position and a right circular cone lying on a surface on its base are examples of stable equilibrium. A body is said to be in unstable equilibrium when it does not regain its orignal position after being slightly disturbed by an external force.



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Q4= Define stress and following terms.

- Tensile stress
- Compressive stress
- Shear stress

Ans= **Stress:**

When the deforming force is applied to an object. The object deforms. In order to bring the object back to the original shape and size, there will be an opposing force generated inside the object. This restoring force will be equal in magnitude and opposite in direction to the applied deforming force. The measure of this restoring force generated per unit area of the material is called stress.

Thus, stress is defined as "The restoring force per unit area of the material". It is a tensor quantity. Denoted by Greek letter σ.

Measured using Pascal or N/m2.

Mathematically expressed as- $\sigma = \frac{F}{A}$

- **Tensile stress:**

If the deforming force or applied force results in the increase in the object's length then the resulting stress is termed as tensile stress. For example: when a rod or wire is stretched by pulling it with equal and opposite forces

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(outwards) at both ends.

- **Compressive stress:** If the deforming force or applied force results in the decrease in the object's length then the resulting stress is termed as compressive stress. For example: When a rod or wire is compressed/squeezed by pushing it with equal and opposite forces (inwards) at both ends.

- **Shear stress:** When the direction of the deforming force or external force is parallel to the cross-sectional area, the stress experienced by the object is called shear stress or tangential stress. This results in the change in the shape of the body.