TRINITY COLLEGE FOR WOMEN NAMAKKAL

Department of Physics

PROPERTIES OF MATTER

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Basic concepts

All objects are made up of matter

- Matter is anything that takes up space and has mass
- Properties are the specific characteristics that describe matter – Matter can be identified using its specific properties
- All matter has the general properties of mass, weight, volume, and density
- Other properties are physical or chemical – Physical: Does not change the identity of the matter – Chemical: Changes the matter in determining the property

WHAT IS MATTER?

MATTER is anything that has mass (amount of material) and volume (amount of space taken up)not matter=energy Mass is the amount of matter in an object Volume is : the amount of space that matter takes up

Matter can be described by its properties

1.Physicsl property

2.Chemical property

1. **Physical property:** a characteristic of a pure substance that can be observed without changing it into another substance• examples: color, taste, odor, volume, mass, density, viscosity, solubility, melting point, boiling point, electrical or thermal conductivity

2. **Chemical properties**: a characteristic of a pure substance that describes its ability to change into a different substance with new properties• examples: rusting, flammable, reacts with vinegar

Bending of Beams: Non-Uniform Bending

Non-Uniform Bending: If the beam is loaded at its mid-point, the depression produced will not form an arc of a circle. This type of bending is called non-uniform bending.

Consider a uniform beam (or rod or bar) AB of length l arranged horizontally on two knife edges K1 and K2 near the ends A and B

The reaction at each knife edge is equal to W/2 in the upward direction and 'y' is the depression at the midpoint E.The bent beam is considered to be equivalent to two single inverted cantilevers, fixed at E each of length and each loaded at K1 and K2 with a weight

A microscope is focused on the tip of the pin.

A weight hanger is suspended and a pin is fixed vertically at mid-point. A microscope is focused on the tip of the pin. The initial reading on the vertical scale of the microscope is taken. A suitable mass M is added to the hanger.

The cross wire is adjusted to coincide with the tip of the pin.

The beam is depressed. The cross wire is adjusted to coincide with the tip of the pin. The reading of the microscope is noted. The depression corresponding to the mass M is found.

The corresponding readings are tabulated.

The experiment is repeated by increasing and decreasing the mass step by step. The corresponding readings are tabulated. The average value of depression, y is found from the observations.

The breadth b, the thickness d and length l of the beam are measured

The breadth b, the thickness d and length l of the beam are measured. The value of Y for the material of the beam is found by the relation.

I Shape Girder

A girder is a metallic beam supported at its two ends by pillars or on opposite walls. It should be so designed that it should not bend too much or break under its own weight.

The depression (y) at the center of a beam of length l, breadth b and thickness d under a load Mg at its mid-point

Hence to reduce the bending for a given load, Young's modulus Y of the material of the beam should be large, b and d of the beam must also be large. The length should be as small as possible. Since depression y is inversely proportional to d3, the depression can be reduced more effectively by increasing the thickness d rather than increasing the breadth b of the beam.

To prevent buckling, a large load-bearing surface is required. Hence, the beam is designed to have a large thickness to minimize bending and a large load bearing surface to prevent buckling. The shape which satisfies these conditions is I. So it is called the I section of the beam or girder. Extra material

Features of I shape girder

As the layers of the beam at the upper and bottom are subjected to maximum stress, more material must be needed there to withstand the strain. As the stress around the neutral layer is small, material in these regions can be removed without loss of efficiency. This would save economy (cost of material of the girder).

Iron girders used in buildings can be easily made of I-section. This type of cross-section provides a high bending moment and a lot of material is saved.

THANK YOU

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