4. Elasticity, Creep & Shrinkage

Modulus of elasticity:-

The modulus of elasticity of a material is the strength against unit deformation of the specimen. When the body is subjected to, stress the energy dispated for elastic (or) plastic (or) elastoplastic.

The stress-strain response under monotonic loading is used to determine the modulus of elasticity.

Note :-

The modulus of elasticity of the concrete is the initial tangent modulus of the stress-strain response of the concrete.

What are the methods to determine modulus of Elasticity :—

There are 2 ways to determine modulus of elasticity

1. Axial stress method
2. Beam Deflection Method.

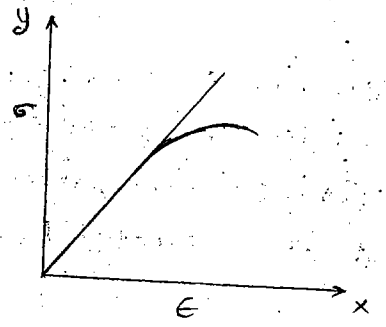
→ The axial stress method specimens are compressed (or) pulled axially and the stress-strain response is prepared.

→ In Beam deflection Method the deflection corresponding to various stages of loading in the Beam is determined and the load-deflection response in Bending is prepared.

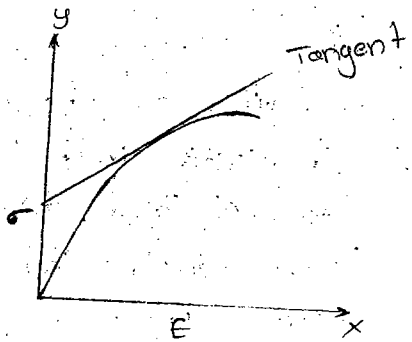
Types of Modulus of Elasticity :—

There are 4 different types of determining modulus of Elasticity

1. Initial Tangent Modulus.
2. Tangent Modulus.
3. Secant Modulus.
4. chord Modulus.



(1)



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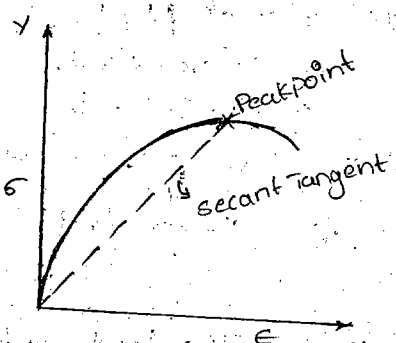

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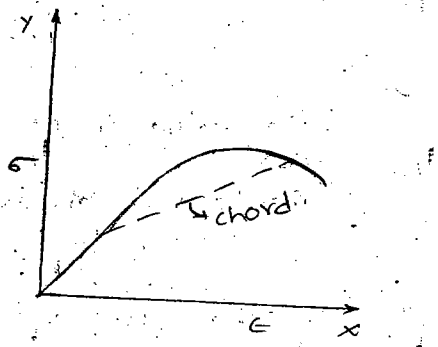


(4)

Dynamic Modulus of Elasticity :—

It is also known as complex modulus of the elasticity.

Def :—

It is the ratio of stress to strain under vibration conditions. It is calculated from data obtained from either free (or) forced vibration test in shear, compression & elongation.

It is a property of visco-elastic materials

The materials that are exhibt both viscosity and Elasticity chaorecterisitics. They are called visco-elastic materials. Eg:- Water.

These materials are resist the shear flow & these are changing their dimensions linearly with time when a stress is applied.

Poissons Ratio:—

When a material is subjected to loading with in elastic limit. Then the ratio of lateral strain to the linear strain. is called poissons ratio.

It remains constant and It is denoted by a letter μ.

A Mathematical formula to calculate μ is

$$\mu = \frac{-e_L}{e}$$

e_L = lateral strain

e = linear strain.

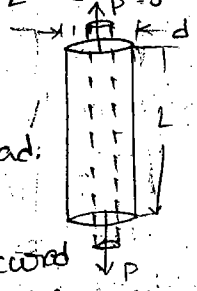
The value of poissons ratio varies between 0.1-0.5

Note:—

The Lateral strain is less than linear strain.

$$e_L < e$$

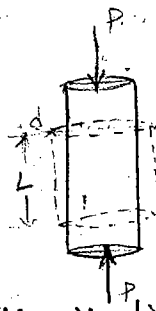
When you are applying a pulling load on body having 'd' as lateral dimension & 'L' is longitudinal dimension.



In this particular condition 'l' is called the length of body & the load is parallel to length.

∴ The charge in dimension is occured a positive value in linear dimensional side.

the decreasing of lateral ... obtained lateral strain will be —ve.



In this condition we are applying a compressive load on the subjected body having linear dimension 'l' & lateral dimension 'd' and we are observed that there is an increase in laterol direction & decreases in longitudinal direction which indicates the lateral strain will be +ve and lineal strain will be -ve

$$\mu = \frac{e_L}{-e}$$

Creep Of Concrete:—

Creep can be defined as the elastic and long term deformation of concrete under a continuous load.

Generally a long term pressure changes the shape of concrete structure and the deformation occurs along the direction of the applied load.

When the continuous load is removed the strain is decreased immediately.

The amount of decreased strain is equal to the elastic strain at the given age. The quick recovery is then followed by a continuous decreasing in strain is known as creep recovery of total creep strain suffered by concrete member.

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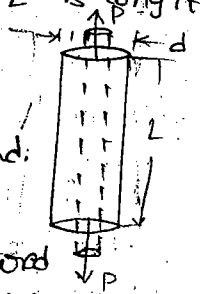

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