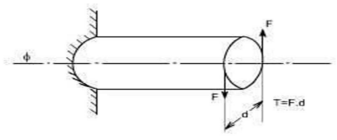
TORSION OF CIRCULAR SHAFTS

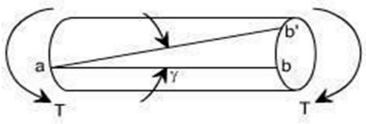
Torsion of circular shafts

- **Definition of Torsion:** Consider a shaft rigidly clamped at one end and twisted at the other end by a torque T = F.d applied in a plane perpendicular to the axis of the bar such a shaft is said to be in torsion.
- **Effects of Torsion:** The effects of a torsional load applied to a bar are section with respect to the other end.nt of one end cross 1 section with respect to the other end.



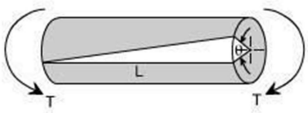
Twisting Moment: The twisting moment for any section along the bar / shaft is defined to be the algebraic sum of the moments of the applied couples that lie to one side of the section under consideration. The choice of the side in any case is of course arbitrary.

Shearing Strain: If a generator a 1 b is marked on the surface of the unloaded bar, then after the twisting moment 'T' has been applied this line moves to a b'. The angle θ measured between the final and original positions of the generators is defined as the shearing strain at the surface of the bar or shaft. The same definition will hold at any interior point of the bar.



Modulus of Elasticity in shear: T he ratio of the shear stress to the shear strain is called the modulus of elasticity in shear OR Modulus of Rigidity and in represented by the symbol

Angle of Twist: If a shaft of length L is subjected to a constant twisting moment T along its l ngth, than the angle θ
through which one end of t he bar will twist relative to the other is known is the angle of twist.



Despite the difference s in the forms of loading, we see that there are number of similarities between bending and torsion, including for example, a linear variation of stresses and strain with position.

Relationship in Torsion:

1st Term: It refers to applied loading ad a property of section, which in the instance is the polar second moment of area.

2nd Term: This refers to stress, and the stress increases as the distance from the axis increases.

3rd Term: it refers to the deformation and contains in which is equivalent to strain for the purpose of designing a circular shaft to with stand a given torque we must develop an equation giving the relation between Twisting moments max m shear stain produced and a quantity representing the size and shape of the cross sectional area of the shaft.