زبان تخصصی مهندسی مکانیک

قسمت هفتم

۳-۲- تنش و کرنش-بارگذاری محوری (Stress and Strain-Axial Loading)

۳-۲-۲- کرنش عمودی تحت بار گذاری محوری (NORMAL STRAIN UNDER AXIAL LOADING)

Let us consider a rod *BC*, of length *L* and uniform cross-sectional area *A*, which is suspended from *B*.

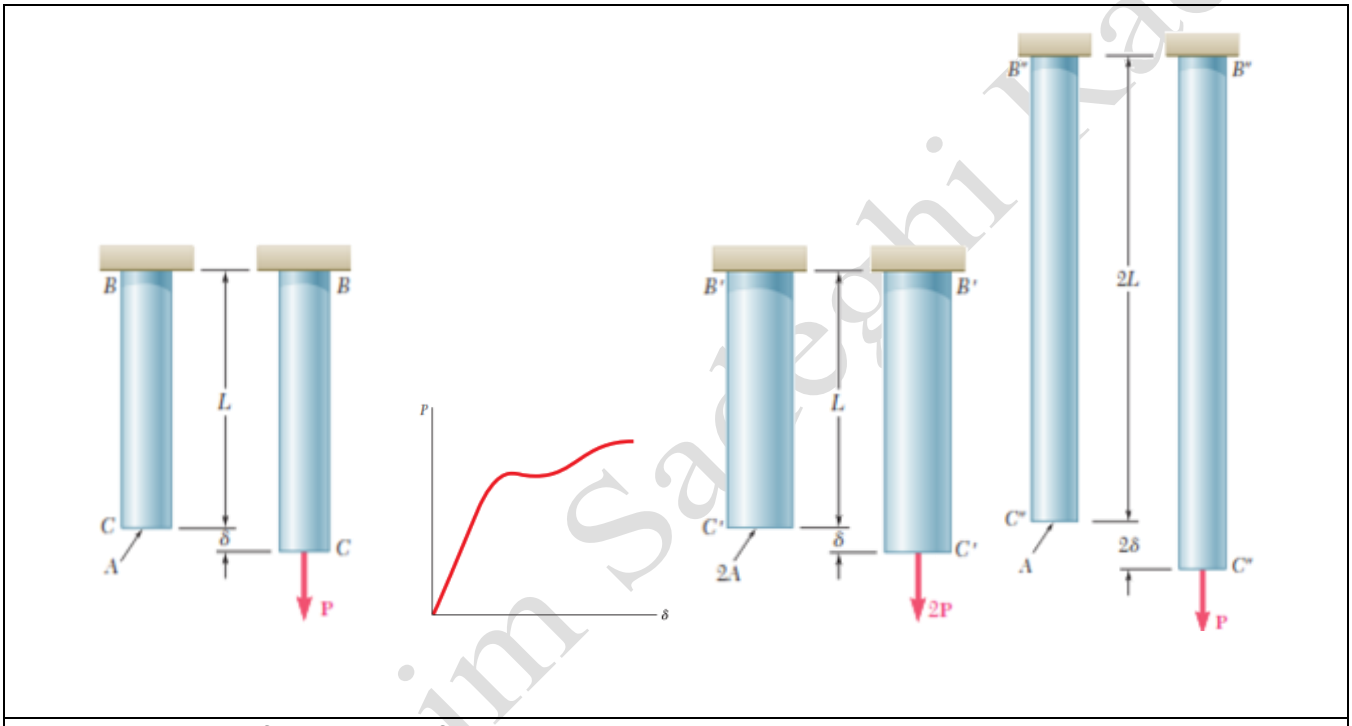

Figure 3 – 5: Deformation of axially-loaded rod.

If we apply a load *P* to end *C*, the rod elongates. Plotting the magnitude P of the load against the deformation δ (Greek letter delta), we obtain a certain load-deformation diagram.

کلمه	معنی	کلمه	معنی
magnitude	مقدار، بزرگی	suspend	معلق شدن، آویزان شدن
certain	معین	elongate	کشیدن، افزایش طول دادن

While this diagram contains information useful to the analysis of the rod under consideration, it cannot be used directly to predict the deformation of a rod of the same material but of different dimensions.

Indeed, we observe that, if a deformation δ is produced in rod *BC* by a load *P*, a load $2P$ is required to cause the same deformation in a rod $B'C'$ of the same length *L*, but of cross-sectional area $2A$.

معنی	کلمه	معنی	کلمه
دربر داشتن، شامل بودن	contain	اطلاعات	information
مفید	useful	مستقیما	directly
پیش بینی	predict	بُعد	dimension
نیاز داشتن	require	ذکر کردن	note
به عبارت دیگر	On the other hand	مورد	case
مشخص کردن	Denote		

We note that, in both cases, the value of the stress is the same $\sigma = P / A$.

On the other hand, a load *P* applied to a rod $B''C''$, of the same cross-sectional area *A*, but of length $2L$, causes a deformation in that rod, i.e., a deformation twice as large as the deformation δ it produces in rod *BC*. But in both cases the ratio of the deformation over the length of the rod is the same; it is equal to δ / L. This observation brings us to introduce the concept of strain:

We define the normal strain in a rod under axial loading as the deformation per unit length of that rod. Denoting the normal strain by ε (Greek letter epsilon), we write

$$\varepsilon = \frac{\delta}{L}$$