زبان تخصصی مهندسی مکانیک

قسمت چهارم

۳-۱-۳- بارگذاری محوری- تنش عمودی (NORMAL STRESS- AXIAL LOADING)

As we have already indicated, rod BC of the example (which is) considered in the preceding section is a two-force member and, therefore, the forces F_{BC} and F'_{BC} (which are) acting on its ends B and C are directed along the axis of the rod. We say that the rod is under axial loading.

An actual example of structural members under axial loading is provided by the members of the bridge truss.

In practice, it will be assumed that the distribution of normal stresses in an axially loaded member is uniform, except in the immediate vicinity of the points of application of the loads. The value σ of the stress is then equal to σ_{ave} and can be obtained from formula $\sigma = \frac{P}{A}$.

However, we should realize that, when we assume a uniform distribution of stresses in the section, i.e., when we assume that the internal forces are uniformly distributed across the section, it follows from elementary statics that the resultant *P* of the internal forces must be applied at the centroid *C* of the section. This means that a uniform distribution of stress is possible only if the line of action of the concentrated loads *P* and P' passes through the centroid of the section (which is) considered. This type of loading is called centric loading and will be assumed to take place in all straight two-force members (which are) found in trusses and pin-connected structures.

However, if a two-force member is loaded axially, but eccentrically we find from the conditions of equilibrium of the portion of member that the internal forces in a given section must Be equivalent to a force *P* applied at the centroid of the section and a couple *M* of moment $M = Pd$. The distribution of forces and, thus, the corresponding distribution of stresses cannot be uniform. Nor can the distribution of stresses be symmetric.

کلمه	معنی	کلمه	معنی
direct	مستقیم، جهت، راستا	indicate	نشان دادن

assume	در نظر گرفتن	truss	خرپا
except	بجز	uniform	یکنواخت
expect	انتظار داشتن	immediate	فوری، بی درنگ
accept	پذیرفتن	vicinity	همسایگی
value	مقدار	centroid	مرکز سطح
take place	رخ دادن	concentrate	تمرکز کردن
eccentrically	خارج از مرکز	equilibrium	تعادل
portion	قسمت، بخش	corresponding	متناظر
symmetric	متقارن		

۳-۱-۴- تنش برشی (SHEARING STRESS)

The internal forces and the corresponding stresses (which are) discussed in previous sections were normal to the section considered. A very different type of stress is obtained when transverse forces P and P' are applied to a member AB ($Figure-3-2$)

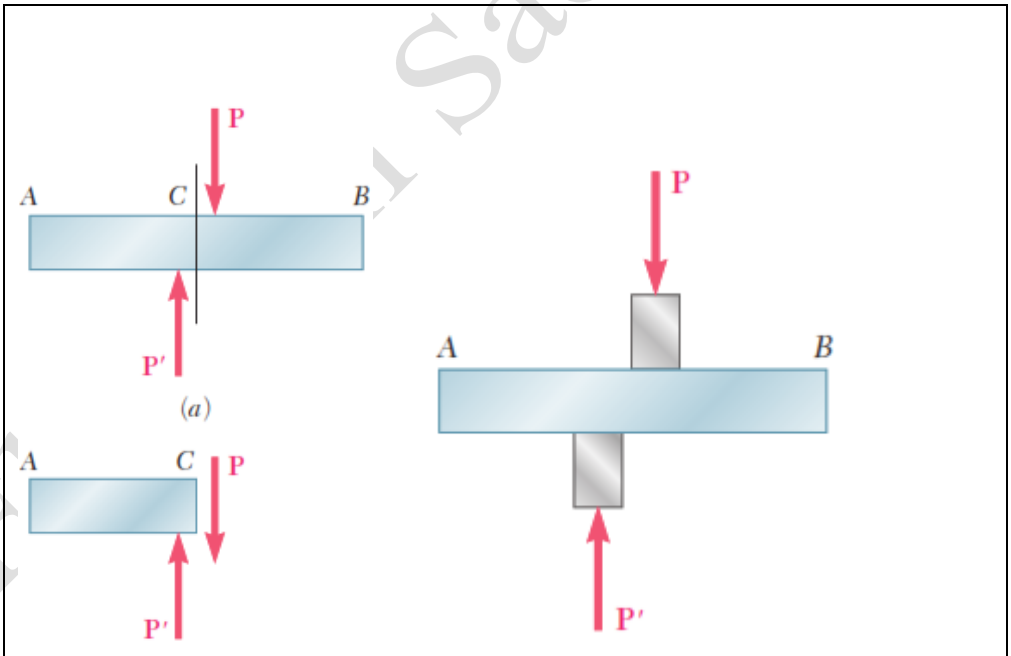

Figure $3-2$: Member with an transvers load

Passing a section at C between the points of application of the two forces , we obtain the diagram of portion AC. We conclude that internal forces must exist in the plane of the section, and that their

resultant is equal to *P*. These elementary internal forces are called shearing forces, and the magnitude *P* of their resultant is the shear in the section. Dividing the shear *P* by the area *A* of the cross section, we obtain the average shearing stress in the section. Denoting the shearing stress by the Greek letter τ (tau), we write:

$$\tau_{ave} = \frac{P}{A}$$

It should be emphasized that the value obtained is an average value of the shearing stress over the entire section. Contrary to what we said earlier for normal stresses, the distribution of shearing stresses across the section cannot be assumed uniform. As you will see, the actual value τ of the shearing stress varies from zero at the surface of the member to a maximum value $\tau_{\max}$ that may be much larger than the average value τ_{ave}.

کلمه	معنی	کلمه	معنی
conclude	نتیجه گرفتن	transverse	عرضی
exist	موجود بودن	magnitude	بزرگی، مقدار
emphasize	تاکید کردن	entire	کل
Contrary to	بر خلاف	vary	متفاوت بودن، تغییر کردن