MECHANICS OF MATERIALS

Shearing Stress In Beam

By

NUR FARHAYU ARIFFIN
Faculty of Civil Engineering & Earth Resources

Chapter Description

- Expected Outcomes
  - Explain the shear stress in beam.
  - Apply the shear formula to calculate the shear stress in the beam at the appropriate location(s).

6.1 Introduction

- In the previous chapter, we have discussed the bending stress that exist in beam
- The other stress is **shear stress** which is equally important in beam analysis
- In this present chapter, we will develop a method for finding the shear stress in a beam having **a prismatic cross – section** and made from homogenous material
- The shear stress in beam will be calculate using **shear formula**

6.2 Transverse Loading In Beam

- When a shear (*V*) is applied, non-uniform shear strain distribution over the cross section will cause the cross section to *warp*.
- The relationship between moment and shear is

$$V = dM/dx$$

- For rectangular cross section, **shear stress varies parabolically** with depth and maximum shear stress is along the neutral axis

Shear Formula

- The shear formula is used to find the **transverse shear stress** on the beam's cross-sectional area

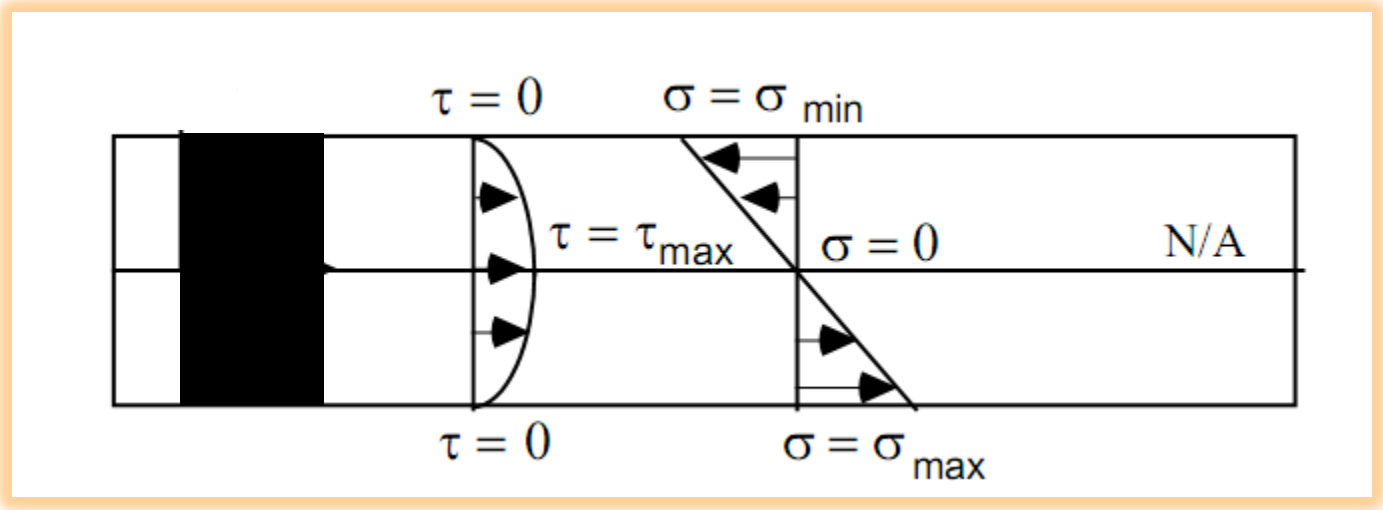
$$\tau = \frac{VQ}{It}$$

$$\text{where } Q = \int_{A'} y\,dA = \bar{y}'\,A'$$

τ = the shear stress in the member
V = internal resultant shear force
I = moment of inertia of the *entire* cross-sectional area
t = width of the member's cross-sectional area

Shear Stress Diagrams

- Comparison between shear stress and bending stress



Shear Stresses

Bending Stresses

References

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- Ferdinand P. Beer, E. Russell Johnston, Jr., John T. DeWolf, David F. Mazurek, Mechanics of materials 5th Edition in SI Units, McGraw Hill, 2009.

MOHD FAIZAL MD. JAAFAR
MOHD AMIRULKHAIRI ZUBIR
NUR FARHAYU ARIFFIN