IQRA NATIONAL UNIVERSITY

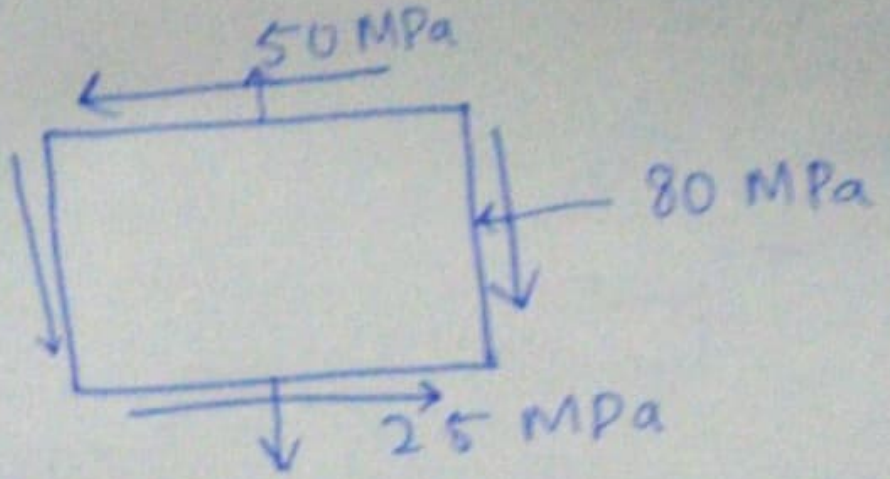
NAME : NOUMAN TAHIR SHAH

ID : 7735

SECTION : A

MODULE : 8TH SEMESTER

Q#



REQUIRED: $\sigma_{x'}, \sigma_{y'}, \tau_{x'y'} = ?$

SOL:→ AS WE KNOW THAT:

$$\sigma_{x'} = \frac{\sigma_x - \sigma_y}{2} + \left(\frac{\sigma_x - \sigma_y}{2}\cos 2\theta + \tau_{xy}\sin 2\theta\right)$$

$$\sigma_{x'} = \frac{80-50}{2} + \left(\frac{80-50}{2}\right)\cos 2(5) + 25\sin 2(5)$$

$$\boxed{\sigma_{x'} = 34.1 \text{ MPa}}$$

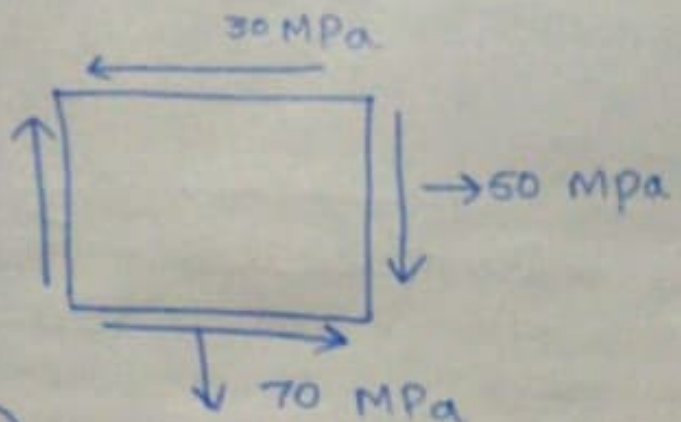
$$\varepsilon_{y'} = \frac{\varepsilon_x - \varepsilon_y}{2} - \left(\frac{\varepsilon_x - \varepsilon_y}{2}\right)\cos 2\theta - \frac{\gamma_{xy}}{2}\sin 2\theta$$

$$\varepsilon_{y'} = \frac{80-50}{2} - \left(\frac{80-50}{2}\right)\cos 2(5) - 25\sin^2(5)$$

$$= \boxed{\varepsilon_{y'} = -4.11}$$

(2)

Q#



GIVEN DATA:

$\sigma_x = 50$ MPa

$\sigma_y = 30$ MPa $\quad \theta = 20^\circ$

REQUIRED DATA:

$\sigma_{x'}, \sigma_{y'}, \tau_{x'y'}$

$\sigma_1, \sigma_2, \tau_{plane\ max} = ?$

SOL: SCALE : 10 MPa = 1 cm

$\sigma_x = 5$ cm, $\sigma_y = 3$ cm

$\tau_{xy} = 7$ cm, $\theta = 20^\circ$

$2\theta = 40^\circ$.

(1) FIND h = location of centre for Mohrs circle.

$$h = \sigma_{AVG} = \frac{\sigma_x + \sigma_y}{2} = \frac{5+3}{2} = 8/2$$

$$\Rightarrow 4 = 4\ cm$$

(2) INITIAL STRESSES:

$= (\delta x', \tau x'y'$

$= (5, 7)$

(3) RADIUS: $R = \sqrt{\left(\frac{\delta x - \delta y}{2}\right)^2 + \tau xy^2}$

$R = \sqrt{\left(\frac{5-3}{2}\right)^2 + (7)^2}$

$= \sqrt{50}$

$R = 7.07 cm$

QUESTION: 03

ANS: stresses Responsible for failure of ductile & brittle material.

Ductile materials are limited by their shear strength. Ductile material usualy fails because the shear stresses exceeds the strength of ductile materials.

⇒ Brittle materials are limited by their tensile strengths. Brittle materials fails when tensile stresses exceeds the strength of material

TWO FAILLRE THEORIES FOR DUCTILE MATERIALS:-

1) MAXIMUM SHEAR STRESS THEORY:?

According to this theory "Failure in ductile material occurs when maximum shear stress in the part exceeds the shear stress in a tensile test Specimen (of same material) at yield The max: shear stress can be determined by drawing Mohr's circle for the element. This result indicates

$T_{max} = \gamma Y/2$

this theory can be used to predict the failure stresses of a ductile material Subjected to any type of loading.

(2) MAXIMUM DISTORTION ENERGY THEORY:-

According to this theory "Failure occurs when the distortion strain energy in the materials exceeds the distortion strain energy in tensile test Specimen (of the same materials) at yeild.

The strain energy density can be one part considered as sum of two parts one part representing the energy needed to cause a volume change of the element with no change in shape, & the other part representing the energy needed to distort the element.

⇒ TWO FAILURE THEORY FOR THE BRITTLE MATERIAL:

(1) MAX : NORMAL STRESS THEORY

According to this theory "A brittle material will fail when the maximum tensile stress, S_1 in the material reaches a value that is equal to ultimate normal stress the material can sustain when it is subjected to simple tension.

⇒ Maximum normal stress Theory is applicable on concrete because tensile stresses are consider and concrete is strong in Compression and weak in tension a concrete is brittle material.

⇒ Mohr's failure criterion Theory applicable to predict the failure of brittle materials as concrete is a brittle material.

⇒ Steal is a ductile material and due to max : shear stress the steal bends which may cause the breaking theory and mimimum distortion. Theory are applicable do ductile material such as steel.