

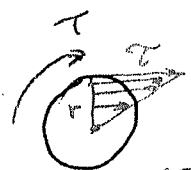
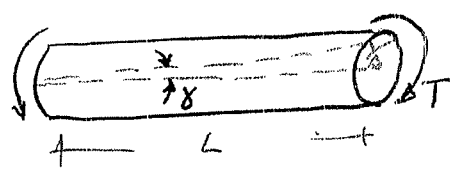
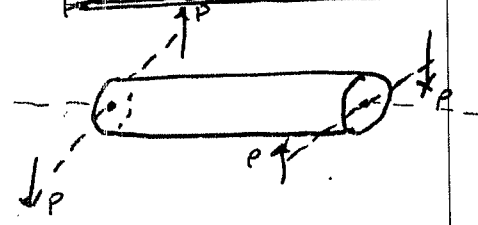
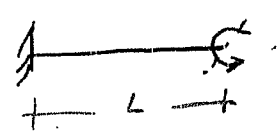


المرحلة: الثانية  
 السنة الدراسية: 2017-2018  
 اسم التدريسي: أ.م.د علي العذاري

20-4-2016  
 د. علي العذاري

10 الصف الثاني  
 1 مقاومة المواد

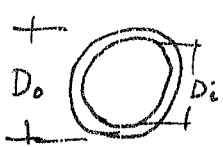
**Torsion (الالتواء)**



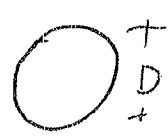
Torsional stress :  $\tau = \frac{T r}{J}$

J: polar moment of Inertia

polar moment of Inertia



$J = \frac{\pi}{32} (D_o^4 - D_i^4)$

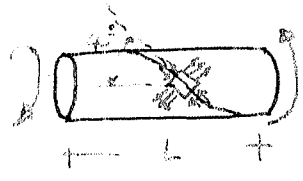
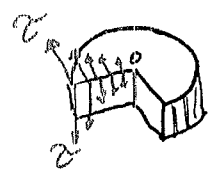


$J = \frac{\pi D^4}{32}$

Torsional strain  $\gamma$   
 modulus of shear G

$G = \frac{\tau}{\gamma}$        $\frac{\text{Stress}}{\text{Strain}}$

angle of twist  $\theta = \frac{T L}{G J}$





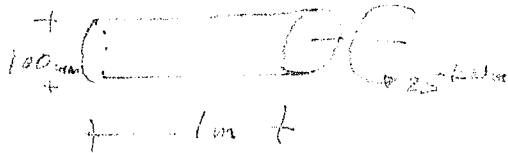
المرحلة: الثانية  
السنة الدراسية: 2017-2018  
اسم التدريسي: أحمد علي العذاري

(12)

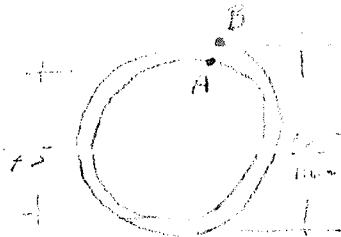
3

واجب

Q<sub>1</sub> - Calculate the angle of twist  $\theta$  for the bar having  $T = 85 \times 10^3 \frac{N \cdot m}{mm^2}$



Q<sub>2</sub> - If we have the inside shearing stress (point A)  $\tau = 50 \frac{N}{mm^2}$   
Calculate the outside shearing stress (point B) i.e.  $\tau_{max}$





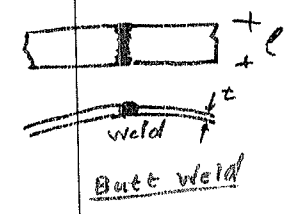
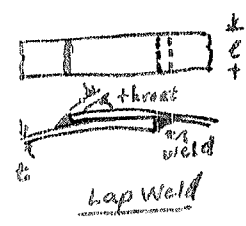
المرحلة: الثانية  
 السنة الدراسية: 2017-2018  
 اسم التدريسي: أ.م.د علي العذاري

- 2 -

14

Welded Joints

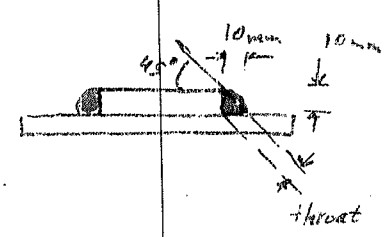
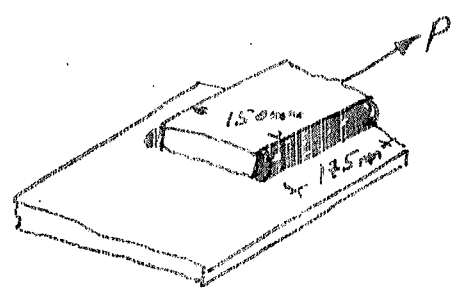
الربط: عن طريق اللحام



$$\sigma_{(Weld)} = 112 \frac{N}{mm^2} \text{ in Tension \& Comp}$$

$$\tau_{(Weld)} = 95 \frac{N}{mm^2} \text{ in Shear}$$

Example 2: Calculate the allowable Force P using the allowable shearing stress =  $30 \frac{N}{mm^2}$



(Answer: P = 1981 N)



المرحلة: الثانية

السنة الدراسية: 2017-2018

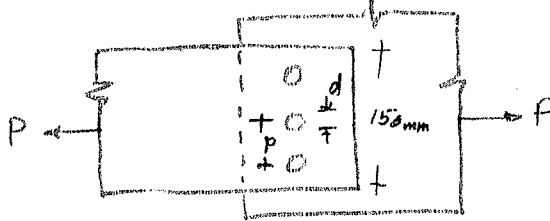
اسم التدريسي: أ.م.د علي العذاري

10-11-2015  
 علي العذاري

واجب / عمل  
 Rivet and Welding joints

(16)  
 مقاوم المواد  
 الصف الثاني

Q<sub>1</sub> - Find the strength of the joint using:

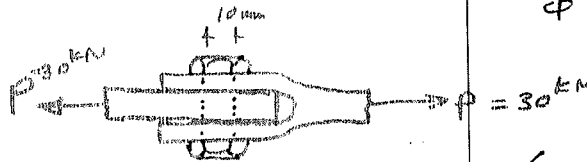


- $t = 6 \text{ mm}$
- $\phi = 12 \text{ mm}$
- $p = 50 \text{ mm}$
- allowable  $\sigma_{\text{tensile}} = 120 \frac{\text{N}}{\text{mm}^2}$
- $\sigma_{\text{Bearing}} = 180 \text{ "}$
- $\tau_{\text{shear}} = 90 \text{ "}$

(Answ: 30.54 kN)

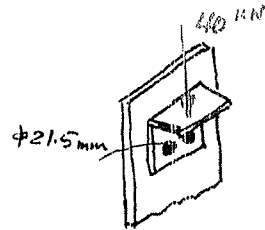
Q<sub>2</sub> - Calculate the stresses in the Rivet using:  $P = 30 \text{ kN}$

$\phi = 10 \text{ mm}$



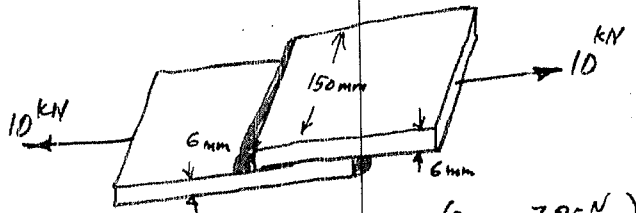
(Answ: 191  $\frac{\text{N}}{\text{mm}^2}$ )

Q<sub>3</sub> - Calculate the shearing stress in the Rivet:



(Answ: 55  $\frac{\text{N}}{\text{mm}^2}$ )

Q<sub>4</sub> - Calculate the stress in the weld



(Answ: 7.86  $\frac{\text{N}}{\text{mm}^2}$ )