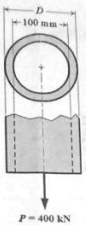
June 9, 2024

Misurata University — School of Engineering

Midterm Exam _ Stress Analysis

1. A hollow steel tube with an inside diameter of 100 mm must carry a tensile load of 400 kN. Determine the outside diameter of the tube if the stress is limited to 120 MN/m².



2. Find the smallest diameter bolt that can be used in the clevis shown in Fig. 1-11b if P = 400 kN. The shearing strength of the bolt is 300 MPa.

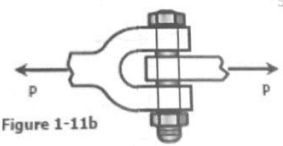


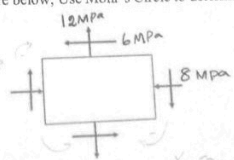
Figure 1-11b

3. For the state of the plane stress shown in the figure below, Use Mohr's Circle to determine:

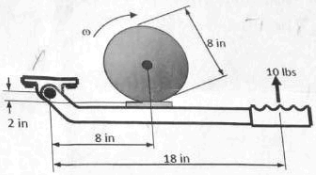
   I. The principle stresses

   II. The orientation of the principle plane

   III. Maximum shear stress



4. For the block brake shown, determine the maximum braking torque that can be provided. The kinetic coefficient of friction between the brake pad and the drum is 0.30.



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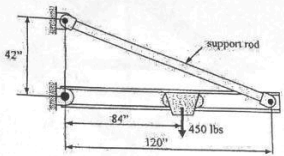
انتهت الأسئلة

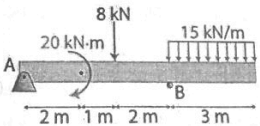
كلية الهندسة – جامعة مصراتة	ربيع 2024
إسم المقرر: تحليل اجهادات	التاريخ :2024/07/18 ف
رقم المقرر: هـ. مك 305	الزمن : ساعتان و نصف
القسم : الهندسة الميكانيكية	

(Answer all the following questions)

1. The uniform main beam of the jib crane shown weighs 120 lbs and supports the load shown. The weight of the other components is negligible. Determine the stress in the 0.75 in diameter support rod.



2. Draw Shear Force and Moment Diagrams for the following problem.



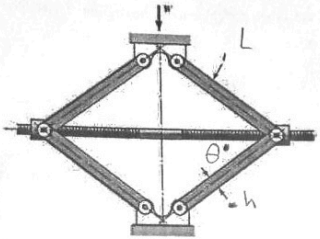
3. For each of the plane stress states listed below, draw a Mohr's circle diagram properly labeled, find the principle normal and shear stresses, and determine the angle from x-axis to σ_1 and show that on the element.

   a) $\sigma_x = 12,\ \sigma_y = 6,\ \tau_{xy} = 4\ cw$

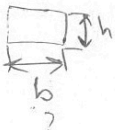
   b) $\sigma_x = 16,\ \sigma_y = 9,\ \tau_{xy} = 5\ ccw$

4. Below is the schematic drawing of a vehicular jack that is to be designed to support a maximum mass of 400 kg based on the use of a design factor nd=2.50. The oppositehanded threads on the two ends of the screw are cut to allow the link angle θ to vary from 15 to 70°. The links are to be machined from AISI 1020 hot-rolled steel bars with a minimum yield strength of 380 MPa. Each of the four links is to consist of two bars, one on each side of the central bearings. The bars are to be 300 mm long and have a bar width of 25 mm. The pinned ends are to be designed to secure an end-condition constant of at least C=1.4 for out-of-plane buckling. Find a suitable preferred thickness and the resulting factor of safety for this thickness.

n=?



P_{cr} =



5. Below is data concerning the shrink fit of two cylinders of differing materials and dimensional specification in inches. Identify the radial interference δ, then find the interference pressure p, and the tangential normal stress on both sides of the fit surface. Poisson's ratio for steel is 0.292, and that for cast iron is 0.211. The modulus of elasticity for steel is $30 * 10^{6}\ psi$, and that for cast iron is $14.5 * 10^{6} psi$.

Inner Cylinder			Outer Cylinder		
Material	d_i	d_o	Material	D_i	D_o
Steel	0	1.002	Cast iron	1.000	2.00

Good Luck

0.5

δ = ?