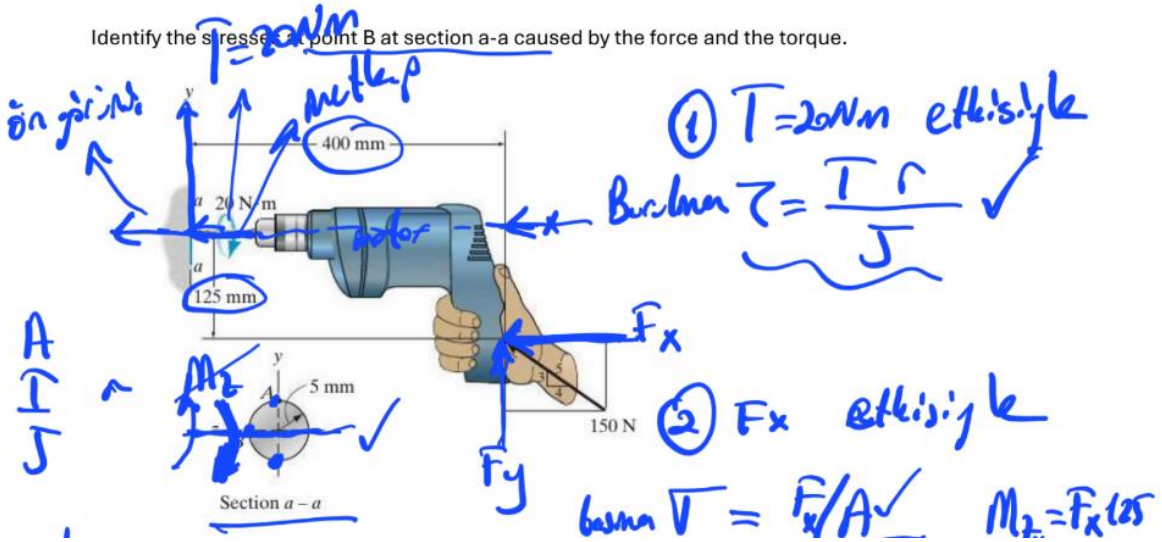
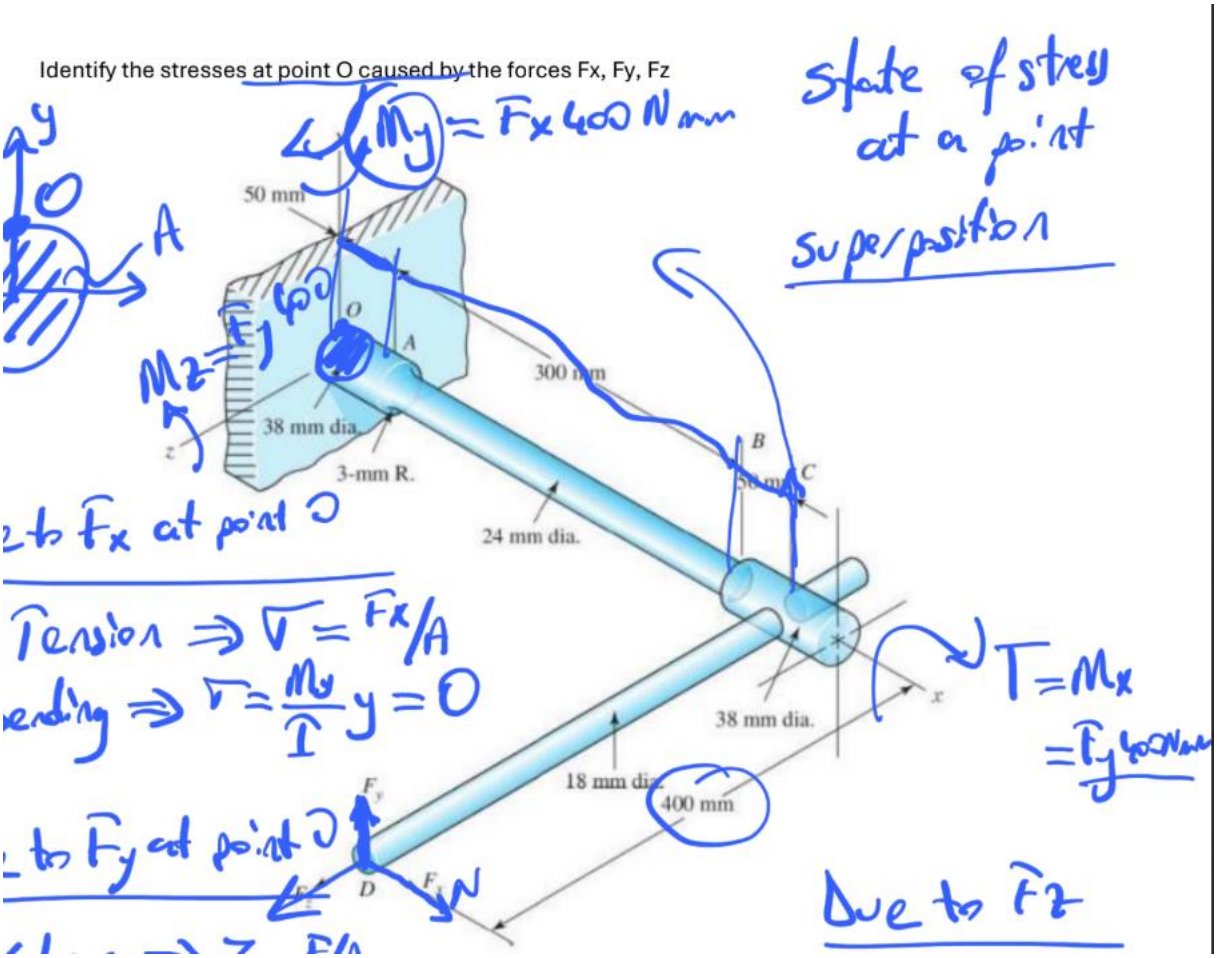
GR1 Q1



GR2 Q1



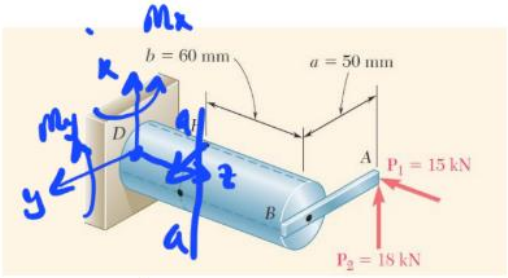
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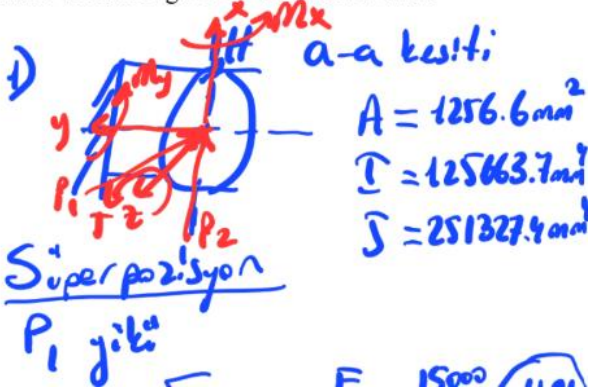
GR1 Q2

Şekilde BD silindirik çubuğunun çapı=40 mm 'dir. Çubuğa bir manivela yardımı ile etki eden kuvvetler şekilde gösterilmiştir.

Buna göre;

1- Probleme ait serbest cisim diyagramını çizerek H noktası için gerilme durumunu gösteriniz.
2- Çubuğun malzemesi AISI 4340 çeliği ise (akma dayanımı 400 MPa), güvenlik katsayısını 1.5 olarak düşünerek, Tresca hasar kriterine göre H noktasının hasar durumunu belirleyin.

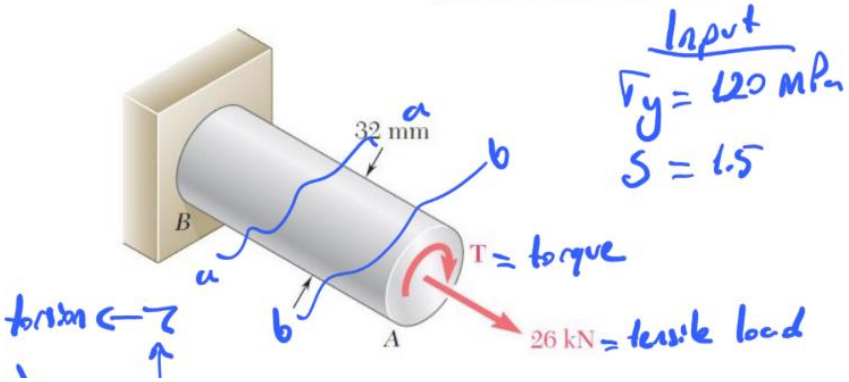




GR2 Q2

The cast-aluminum rod shown is made of an alloy for which has a yield strength of 120 MPa. Assume that the safety factor as **1.5**,

1. Determine the state of stress due to acting force and torque to the bar.
2. Considering Von-Misses failure criteria, calculate the maximum torque.



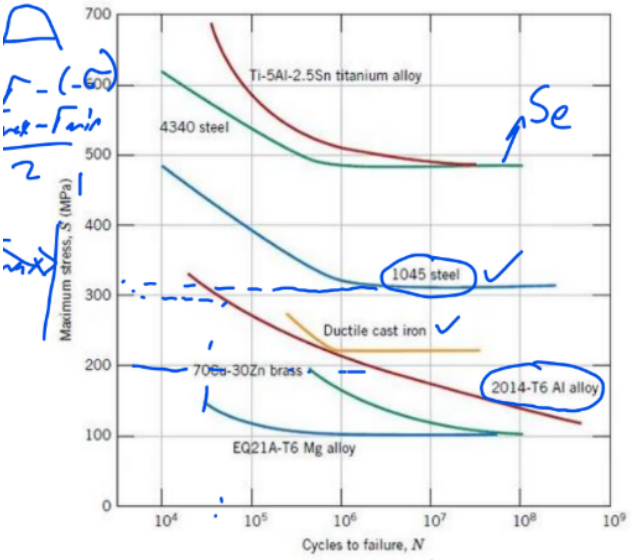
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GR1 Q3

1045 çeliği bir malzemenin S-N eğrisi aşağıda verilmiştir. Bu malzemeden yapılmış çapı 50 mm olan bir silindirik çubuğa tam değişken olmak üzere ± 500Nm eğilme momenti gelmektedir. Bu yükleme durumu için sonsuz ömre göre güvenlik katsayısını hesaplayınız.

Malzemenin akma dayanımı σ_y = 600 MPa olup bazı düzeltme faktörleri şu şekilde verilmiştir (Marin faktörleri) yüzey pürüzlülüğü faktörü, **K_s = 0.8,** boyut faktörü **K_b = 0.6**

Eğer gerekli ise Soderberg yaklaşımını kullanın.



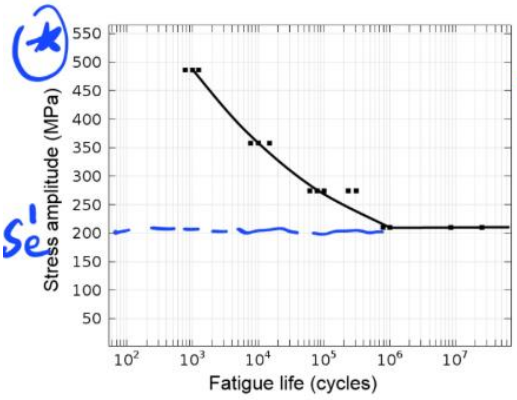
GR2 Q3

A circular cross section rod with an S-N curve given below is operated under tensile compression loads.

For F_{max} = 20 kN, F_{min} = -20 kN, determine the diameter of the rod according to the infinite life by taking the safety factor S = 2.

The yield strength of the material is σ_y = 600 MPa, Surface roughness factor, **K_s = 0.8,** size factor **K_b = 0.6**

Use the Soderberg approach if necessary.



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GR1 Q4

Bir civata somun bağlantısında civatanın rijitliği 1.2 MN/mm ve parçaların toplam rijitliği ise 2.8 MN/mm olarak verilmiştir. Bu bağlantının kalıcı olarak kurulması düşünülmüş ve M7x1 4.8 kalitesinde seçilmiştir.

Buna göre

a. Bu bağlantı için önyük kuvvetini bulunuz.
b. Sisteme 1000 N'luk bir dış çekme kuvveti geldiği durumda ön yük üçgenini çiziniz.

Verilenler

$k_b = 1.2\ MN/mm$

$k_p = 2.8\ MN/mm$

$F_i = 0.9\ F_{proof}$

M7x1 4.8

TABLE 10.5 Specifications for Steel Used in Millimeter Series Screws and Bolts

SAE Class	Diameter d (mm)	Proof Load (Strength)[a] S_p (MPa)	Yield Strength[b] S_y (MPa)	Tensile Strength S_u (MPa)	Elongation, Minimum (%)	Reduction of Area, Minimum (%)	Core Hardness, Rockwell Min	Core Hardness, Rockwell Max
4.6	5 thru 36	225	240	400	22	35	B67	B87
4.8	1.6 thru 16	310	—	420	—	—	B71	B87
5.8	5 thru 24	380	—	520	—	—	B82	B95

TABLE 10.2 Basic Dimensions of ISO Metric Screw Threads

	Coarse Threads			Fine Threads		
Nominal Diameter d (mm)	Pitch p (mm)	Minor Diameter d_r (mm)	Stress Area A_t (mm^2)	Pitch p (mm)	Minor Diameter d_r (mm)	Stress Area A_t (mm^2)
3	0.5	2.39	5.03			
3.5	0.6	2.76	6.78			
4	0.7	3.14	8.78			
5	0.8	4.02	14.2			
6	1	4.77	20.1			
7	1	5.77	28.9			
8	1.25	6.47	36.6	1	6.77	39.2
10	1.5	8.16	58.0	1.25	8.47	61.2

a) $F_i = 0.9 \times F_{proof}$

$= 0.9 \times S_{proof} \times A_t$

$= 0.9 \times 310 \times 28.9$

$= 8063\ MPa \cdot mm^2$

$= 8063\ N$

b) $P = 1000\ N$ önük üçgeni

GR2 Q4

Quiz 4 – November 4th 2025

For a bolted assembly of 6 bolts, the stiffness of each bolt is 1.2 MN/mm and stiffness of members is 2,8 MN/mm. Assuming the external load is homogeneously distributed among the bolts, the joint is subject to occasional disassembly for maintenance and should be preloaded accordingly. The bolts are M6 x 1 Class 4.8 with rolled threads.

(a) Predict the maximum external load that can be applied without exceeding the proof strength of the bolts.
(b) Predict the maximum external load that can be applied without causing the members to come out of compression.

Input

$N = 6$

$k_b = 1.2\ MN/m$

$k_p = 2.8\ MN/m$

$F_i = 0.75\ F_{pr}$

M6

Solution

$F_i = 0.75\ F_{proof}$

$= 0.75 \times 310 \times 20.$

$= 4673.3\ N$

TABLE 10.5 Specifications for Steel Used in Millimeter Series Screws and Bolts

SAE Class	Diameter d (mm)	Proof Load (Strength)[a] S_p (MPa)	Yield Strength[b] S_y (MPa)	Tensile Strength S_u (MPa)	Elongation, Minimum (%)	Reduction of Area, Minimum (%)	Core Hardness, Rockwell Min	Core Hardness, Rockwell Max
4.6	5 thru 36	225	240	400	22	35	B67	B87
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8	1.25	6.47	36.6	1	6.77	39.2
10	1.5	8.16	58.0	1.25	8.47	61.2

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GR1 Q5

Quiz 5 – November 13th 2025

A TRIPLE SQUARE THREAD power screw has an input power of 2 kW at 80 rpm. The screw major diameter is 50 mm with a pitch of 10 mm.

Considering the friction coefficient for the thread as 0.1 and for the collar as 0.15, and collar friction radius as 75 mm, find the maximum axial force(considering raising the load) that can be produced and the efficiency of the mechanism.

ÜÇ HELİSLİ KARE DİŞLİ bir güç vidasının giriş gücü 80 rpm'de 2 kW'dır. Vidanın dış çapı 50 mm ve hatve 10 mm'dir.

Diş için sürtünme katsayısını 0,1, sıkma bileziği için 0,15 ve sıkma bileziği sürtünme yarıçapını 75 mm olarak kabul ederek, üretilebilecek maksimum eksenel kuvveti (yükün kaldırılması sırasında) ve mekanizmanın verimliliğini bulun.

$l = np = 3 \times 10 = 30\,mm$

$$T_R = \frac{F d_m}{2}\left(\frac{l + \pi f d_m}{\pi d_m - f l}\right) \qquad T_L = \frac{F d_m}{2}\left(\frac{\pi f d_m - l}{\pi d_m + f l}\right) \qquad e = \frac{T_0}{T_R} = \frac{F l}{2\pi T_R}$$

$T_c = \frac{F f_c d_c}{2}$

Verilenler

Çözüm

$d_m = 50 - 10/2 = 45\,mm$

GR2 Q5

Quiz 5 – November 11th 2025

A DOUBLE SQUARE THREAD power screw has an input power of 2 kW at 60 rpm. The screw major diameter is 50 mm with a pitch of 10 mm.

Considering the friction coefficient for the thread as 0.1 and for the collar as 0.15, and collar friction radius as 75 mm, find the maximum axial force(considering the raising the load) that can be produced and the efficiency of the mechanism.

$$T_R = \frac{F d_m}{2}\left(\frac{l + \pi f d_m}{\pi d_m - f l}\right) \qquad T_L = \frac{F d_m}{2}\left(\frac{\pi f d_m - l}{\pi d_m + f l}\right) \qquad e = \frac{T_0}{T_R} = \frac{F l}{2\pi T_R}$$

$T_c = \frac{F f_c d_c}{2}$

Solution

$l = np$

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