



IZMIR UNIVERSITY OF ECONOMICS
Faculty of Engineering

Term : 23-24 Fall
Course : ME 208 – Mechanics of Materials
Exam : Midterm
Date : 18.11.2023
Duration : 90 min.

Full Name :
Student ID :
Classroom :: **Section** :

Information on exam rules

Electronic devices such as laptops, mobile phones, and smartwatches are generally prohibited in the examination room. However, exceptions can be made for individuals with special needs, provided they have valid medical documentation. Requests for exceptions must be submitted with prior written approval from the academic advisor, and they should include details on the necessary measures to maintain the integrity and security of the examination.

Please refrain from engaging in cheating or any other prohibited activities during the examination. Suspected cheating may result in a score of zero on your exam, and any students found cheating may face disciplinary actions in accordance with law #2547. This includes actions such as using unauthorized electronic devices, communicating with classmates, exchanging exam or formula sheets, or using unauthorized written materials during the exam, all of which qualify as attempted cheating.

Declaration

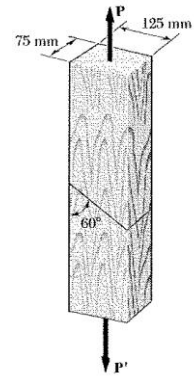
I affirm that the activities and assessments completed as part of this examination are entirely my own work and comply with all relevant rules regarding copyright, plagiarism, and cheating. I acknowledge that if there is any question regarding the authenticity of any portion of my assessment, I may be subject to oral examination. The signatory of evidence records may also be contacted, or a disciplinary process may be initiated as per law #2547.

Signature of Student:

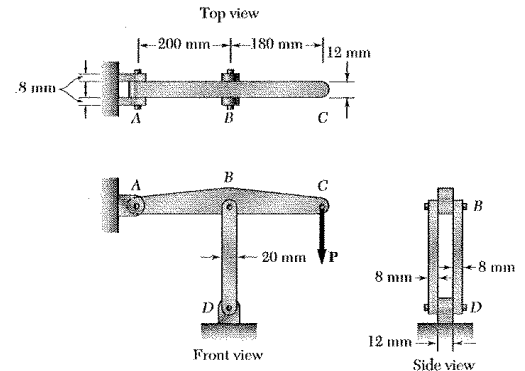
Question	1	2	3	4	5
Score					
Total					

QUESTIONS

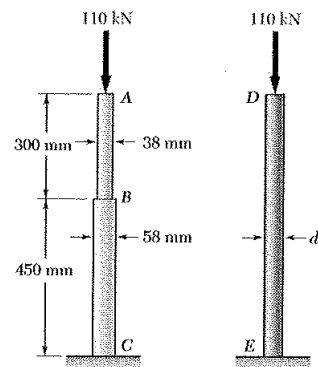
- 1) The 5.6 kN load P is supported by two wooden members of uniform cross section that are joined together. Determine the normal and shearing stress in the joined section. (10 P)



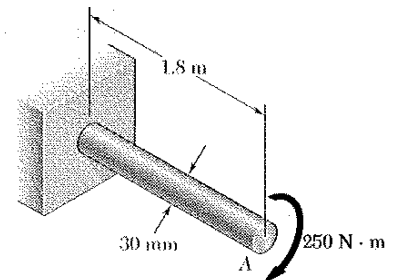
- 2) In the structure shown, an 8 mm-diameter pin is used at A, and 12 mm diameter pins are used at B and D. Knowing that the ultimate shearing stress is 100 MPa at all connections and the ultimate normal stress is 250 MPa in each of the two links joining B and D. Determine the allowable load P if an overall factor of safety 3 is desired. (25 P)



- 3) The aluminum rod ABC ($E = 70$ GPa), which consists of two cylindrical portions AB and BC, is to be replaced with a cylindrical steel rod DE ($E = 200$ GPa) of the same overall length. Determine the minimum required diameter d of the steel rod if its vertical deformation is not to exceed the deformation of the aluminum rod under the same load and if the allowable stress in the steel rod is not exceed 165 MPa. (25 P)



- 4) a) For a solid steel shaft shown ($G = 77$ GPa), determine the angle of twist at A. b) Solve option a, assuming that the steel shaft is hollow with 30 mm outer diameter and a 20 mm inner diameter. (20 P)



- 5) The beam shown is made of aluminum for which the allowable stress is 144 MPa in tension and 180 MPa in compression. Determine the largest couple M that can be applied to the beam. (20 P)

