EMEC350 – Homework 03

School of Engineering

American University in Dubai

Course Code: EMEC350	**Course Name: Design of Mechanical Systems**
Semester & Year: Fall 2019	**Date: Thursday, 03 October 2019**
Instructor: Salem Haggag	**DUE Date: Thursday, 10 October 2019**

Name:	**ID:** .....
Signature:	**Major:** .....

Directions

- Homework should be submitted with this cover page.
- Do not stable homework instead use paper clip.
- Use single side A4 Engineering paper size for your homework.
- One objective of your homework is to communicate, so neatness counts. 20% will be deducted for lack of neatness or not following the directions.
- Late submissions will not be accepted.
- Notes and textbook are allowed.
- Your work must be original: no copying from any other term or any other class, and no copying from any classmate.

Learning Outcomes	**P 1**	**P 2**	**P 3**	**P 4**	**P 5**			
LO1. Design Machine components and systems to meet specific functional requirements and evaluate their safety, economic and environmental factors.	●	●	●	●	●			
LO2. Function in different roles within a team to design and fabricate machine elements and simple mechanical systems.								
LO3. Document and present the technical specifications of mechanical elements and systems through proper technical writing, charts, graphs, and oral presentations.								
LO4. Discuss examples of contemporary legal and professional constraints governing the design and fabrication of mechanical components and systems.								

LO1					
Question 1	**Question 2**	**Question 3**	**Question 4**	**Question 5**	**Total**
/25	/20	/20	/15	/20	**/100**

*By signing above you confirm that the submission has been fully prepared by you. Any suspicion of copying or plagiarism in this work will be reported to the Dean or Chair for appropriate investigation and appropriate disciplinary actions, which may result in a "0" on the work, an "F" in the course or other penalties as described in the *Student Handbook*, which can be found online at: http://www.aud.edu/files/StudentHandbook.pdf

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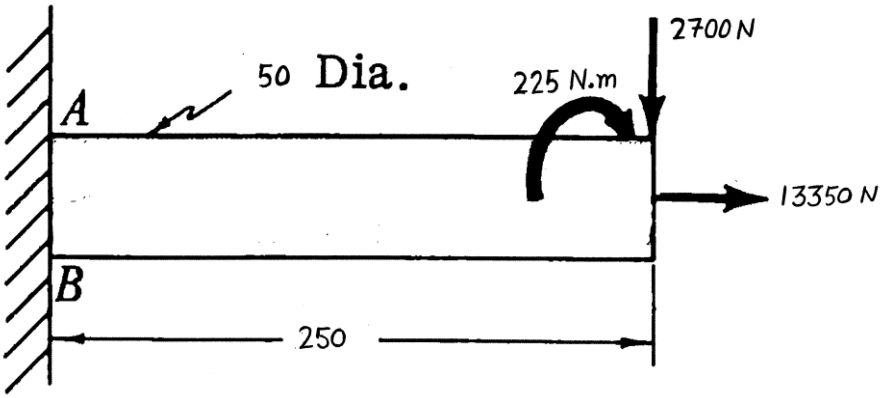
Question 1 (15 + 10 = 25 Points)

A **50 mm** diameter steel shaft is loaded as shown in the Figure below, determine:

a) The principal stresses at point **A** and **B**

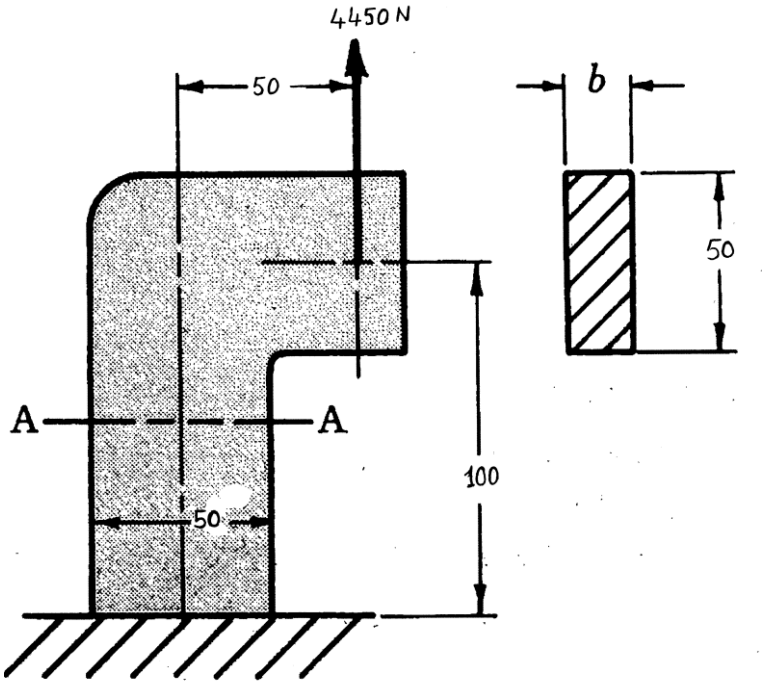
b) The principal strains at point **A** and **B**

Note that all dimensions are in millimeters.



Question 2 (20 Points)

Determine the required thickness of the steel bracket at section **A-A**, when loaded as shown in the Figure below, in order to limit the tensile stress to **70 MPa** (note that all dimensions are in millimeters).



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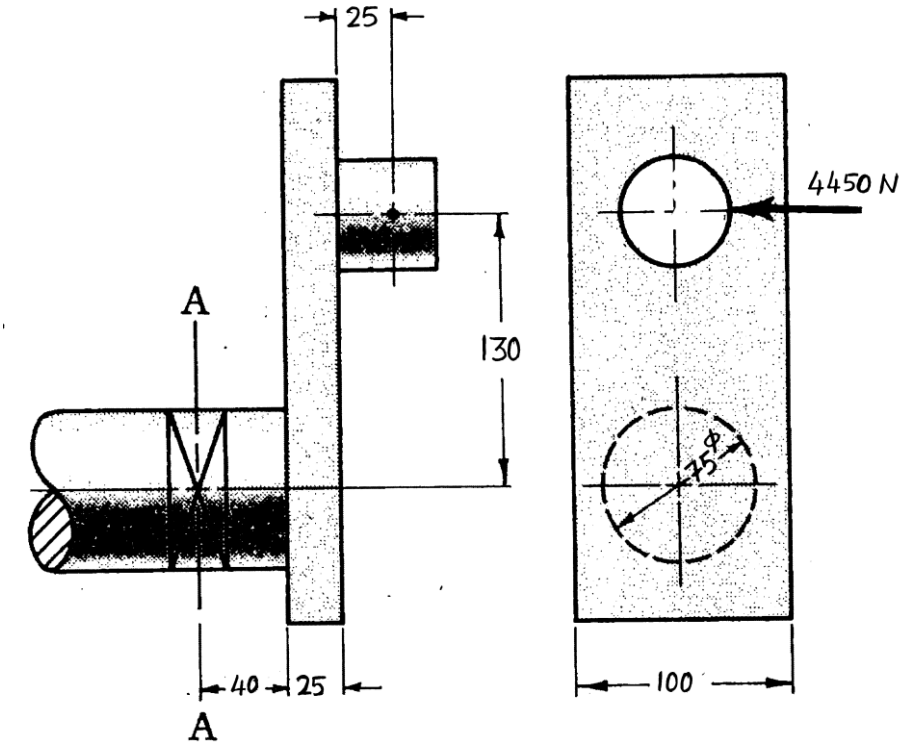
Question 3 (15 + 5 = 20 Points)

The steel crank shown in the Figure below is loaded with **4450 N,** the load is assumed to be concentrated at the center of the crank pin

a) Determine the maximum normal stress and the maximum shear stress at section **A-A**
b) Calculate the angular deflection (in degrees) of the crank arm

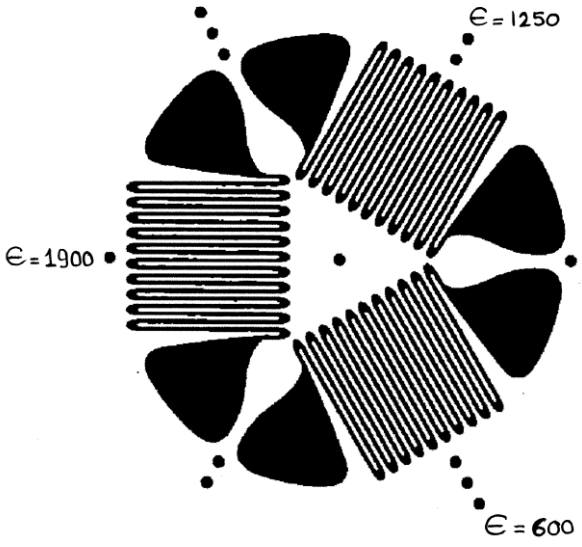
Note that all dimensions are in millimeters.



Question 4 (7.5 + 7.5 = 15 Points)

The figure below shows a strain gages rosettes that are attached on the surface of a certain steel element. The stain values (in micrometers per meter) are given to the side of each strain gage.

a) Determine the magnitude of the principal strains.
b) Determine the magnitude of the principal stresses.



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Question 5 (15 + 5 = 20 Points)

For the mechanical arrangement shown in the figure below, if the structure is made of **1010A** steel,

a) Check the design safety (will fail or not) of members **AB** and **CD**.
b) Calculate the strain in member **AB**