

YOUR NAME _____

SECTION (TA) _____

ENGRD 202: MECHANICS OF SOLIDS
MAKE-UP PRELIM I: December 9, 2002 9:00-10:30 AM

Please carry out all work on these sheets; additional sheets are available, as needed.

Possibly Helpful Hints:

- Vector** quantities should be distinguished from scalars. Points will be lost if **vectors** are not properly identified.
- Free-body diagrams** should be drawn for almost all mechanics problems.
- All answers must have **correct units**.
- Questions posed to practicing engineers often contain **extraneous information**; perhaps here too.
- If you write two answers to a question, **only the first will be graded**.
- Box** or **circle** all answers.

Academic Integrity is expected of all students of Cornell University at all times, whether in the presence or absence of members of the faculty and staff.

Understanding this, I declare that I shall not give, use or receive unauthorized aid in this examination.

Signature of Student: _____

Problem 1. _____/35

Problem 2. _____/40

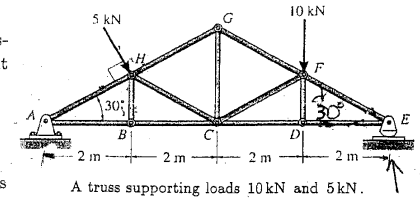
Problem 3. _____/35

TOTAL _____/110

35 Points

- 5
- 5
- 10
- 5
- 10

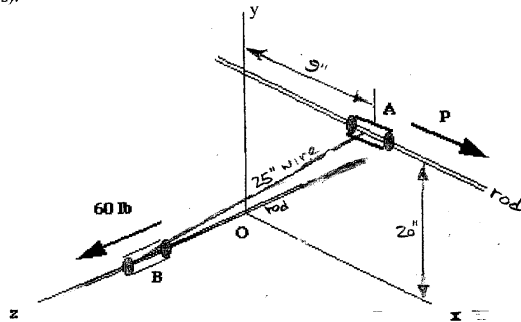
1. **Equilibrium of Structures.** The truss-like structure shown in the figure at right is built of nearly weightless members whose dimensions are as indicated. All the joints of the truss are pin-joints. A downward vertical load of 10 kN is applied at joint F , and a load of 5 kN is applied normal to the truss at joint H , as shown.



- Is this truss *statically determinate*? Justify your response.
- Draw the *free body diagram* of the truss showing the applied and reaction forces acting on the structure.
- Determine the reaction forces at points A and E . Clearly indicate the magnitudes and directions.
- Are there any members of this truss which are *zero force* members? If so, identify the members which have this property. And clearly state why these members are of this type.
- Find the forces in the following members: bar- EF ; bar- DE ; bar- CD and bar- FD . Specify whether these forces are tensile or compressive.

2. (40%) Collars A and B are connected by a 25-in.-long wire and can slide freely on frictionless rods (double lines).

a. (10) Determine the unit vector along the wire, pointing from B to A.

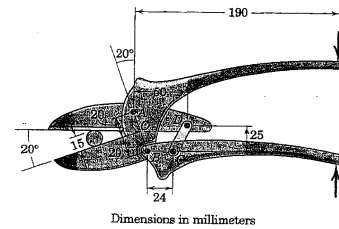


b. (10) If the force in the 25-in. wire is T lb. tension, write the force on collar B due to the wire in vector form. What is the moment of this force about the origin, O ?

c. (10) If a 60-lb. force is applied to collar B as shown, determine the value of the force in the wire and tell if it is tension or compression.

d. (10) Calculate the corresponding force P required to maintain the equilibrium of the system.

3 (35%) For the pruning shears shown, determine the force Q applied to the circular branch of 15-mm diameter for a gripping force $P = 200$ N. (Suggestion: First draw a free-body diagram of the isolated branch.)



Dimensions in millimeters