Write your name here:

This exam counts 20% of your grade for this course; your instructions are as follows:

1) You have 75 minutes to finish this exam.
2) No books or discussion are allowed. If you have questions please ask the proctor.
3) It is your responsibility to communicate your understanding of the subject matter.

Section 1: (6 points each, 60 points total)

Answer 10 and only 10 of the questions in this section. Clearly mark the two questions that you don’t want graded. No partial credit.

1. Explain the differences between rock bolts and dowels, including the situations under which each would be used.

2. In the Rock Mechanics rating (RMR) classification system, discontinuity properties have a much greater influence than uniaxial compressive strength of the rock. Why is this a reasonable approach?
3. C represents cohesion and $\tan \phi$ represents friction angle, explain those properties?

4. In your own words, how does water affect the stability of a rock slope?

5. With respect to slope stability, what does the term "Factor of Safety" mean?

6. How is a stereonet used in assessing the criteria for a rock mass to undergo a sliding failure?
7. Why are rock mass classification systems such as RMR or RQD useful for design purposes?

8. Convert the following dip/strike measurements to dip/dip direction.

   78/S23E and 12/N43W

9. Consider two rock fractures, one freshly broken with rough unweathered surfaces and the other highly weathered to form a clay gouge. How will cohesion and friction angle differ between the two.

10. What are the primary criteria for a rock mass to undergo toppling failure?
11. How does a toe berm improve the stability of a rock slope?

12. There are two inclined boards at the front of the class. Pick one of them and measure the dip and dip direction using the provided Brunton compass. Be sure to mark down which board you measured (there is a number on the face of each).
Section 2: (10 points each, 40 points total)

You must do all four problems in this section.

1. Calculate the factor of safety against sliding failure for the block shown in the above sketch, given that \( H = 4.0 \) ft, \( L = 17.5 \) ft, the unit weight is 155 PCF, friction angle along the sliding surface is 34°, and the tension applied by horizontal rock bolts is 2500 lb per linear foot of slope (into the page).
Questions 2-4 refer to the following two discontinuity planes. Your answers should be on a single stereographic plot that is to be submitted with your exam. Your plot should be labeled, with the outer reference circle and North clearly indicated.

Plane 1: 236/56
Plane 2: 032/78

2) Plot the great circles for these two planes.

3) Plot the poles for these two planes.

4) Do these planes intersect one another? If so, what is the trend and plunge of the line of intersection?