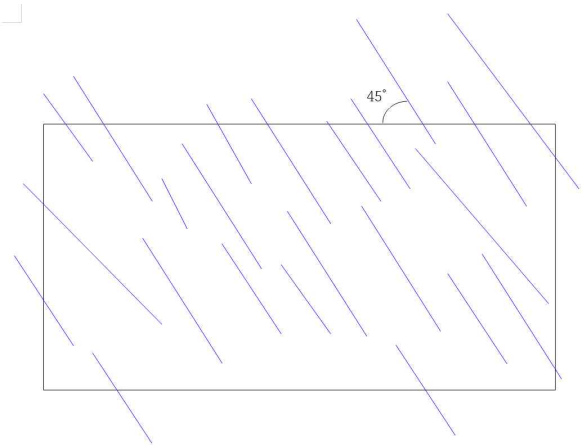
Midterm Exam

April 21st, 2021

1. Explain/solve followings. [40]
   1) Definition and classification of a discontinuity in rock mass. [4]
   2) What are the six properties of discontinuities suggested by Piteau in 1973. [3]
   3) Compare the advantages of logging with a television (BIPS) and televiewer, respectively [3].
   4) Explain the following terms for joint trace filtering: trimming, curtailment, truncation, and censoring [4]
   5) What are the three types of joint traces according to the no. of end points in a sampling window? [3]
   6) Compare the equal-angle projection and equal-area projection [10]
   7) Dip direction/dip of a joint of which strike/dip is N65°E/20°SE [2]
   8) X, Y, and Z components of the unit normal vector of the above joint (N65°E/20°SE) when *X*, *Y*, and *Z* axes indicate the east, north, and upward, respectively. [3]
   9) Estimate an areal frequency and a mean trace length of the joint traces belonging to the same joint set shown below. The width and height of the rectangular window is 10 m and 5 m, respectively. Solve this problem using the end-point estimator suggested by Pahl. [8]



2. Derive the maximum likelihood estimator of the truncated Fisher (Arnold) distribution shown below. [20]

$$f(\theta) = \frac{K \sin\theta \, e^{K\cos\theta}}{e^{K} - 1}$$

3. Derive a probability density function of semi-trace length distribution of which both ends have been cut off by trimming and curtailment. The trimming and curtailment took place at 0.05 m and 5 m, respectively. The trace length in an infinite rock exposure follows a negative exponential distribution where the mean trace length is 2 m. [20]

4. Derive the following equation. [20]

$$\mu_L = \frac{\pi M_{S2}}{4\mu_S}$$

where M_{S2} is the 2nd moment of joint diameter distribution, μ_S is a mean joint diameter, and μ_L is a mean joint trace length, respectively.