

Mid-Term Exam Questions

9th April 2018

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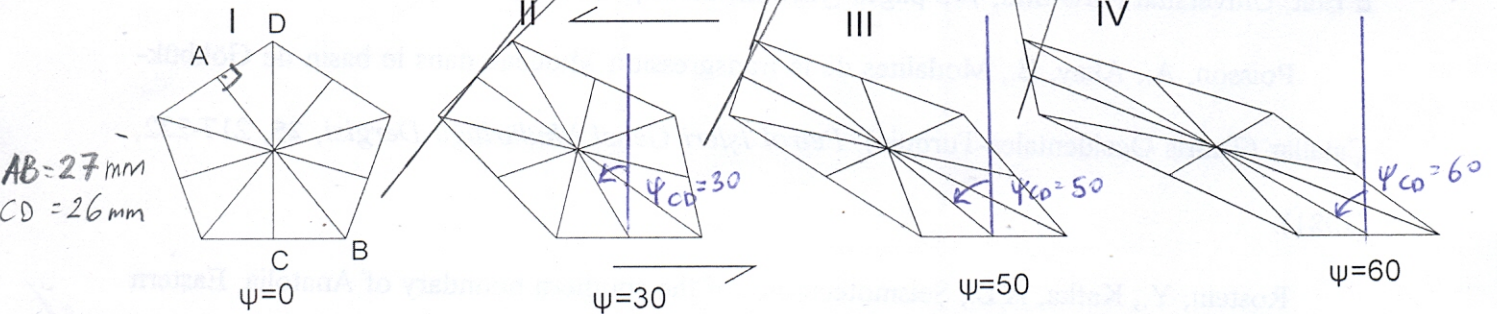
1. Use stereographic projections to answer the following questions.
  - a) Plot the following planes as great circles ( $\beta$  diagram) and  $\pi$  poles: 27/18NW, 120/87NE and 138/65SW.
  - b) Horizontal bedding has been cut by cleavage at 33/64NW. Find the trend and plunge of the intersection lineation.
  - b) Plot the lines 28/68NE, 57/36SW, 10/0, vertical line and 132/8SE.

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2. Provide text and diagrams to the following questions
  - a) Draw a 3D diagram of a fold showing anticline/antiform, syncline/synform, fold/hinge axis, fold limbs, fold axial plane.
  - b) Explain pure shear and simple shear with the help of diagrams
  - c) What are the factors that control ductile versus brittle behaviour of the rocks, and how do they affect ductile versus brittle behaviour?
  - e) What are the crenulation cleavage and axial planar cleavage.
  - f) What is the relation between cleavage plane, mineral stretching lineation and the axes of the finite strain ellipsoid. Explain your answer with the help of a diagram.
  - g) What is ellipticity and how is it calculated?

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- 3) The pentagon shown below is deformed by simple shear with angular shear strain values shown.



- a) Calculate the longitudinal and angular changes along the line AB, and CD and show them on  $e$ - $\gamma$  and  $\gamma$ - $\gamma$  diagrams.
- b) What are the **incremental** longitudinal strains along the line AB between stages II and III?
- c) What is the relation between the shear strain applied to the pentagon and that observed along CD. Why is there such a relationship?
- d) Assuming that the line CD is deformed in 2 minutes between the stages II and IV, calculate the strain rate.

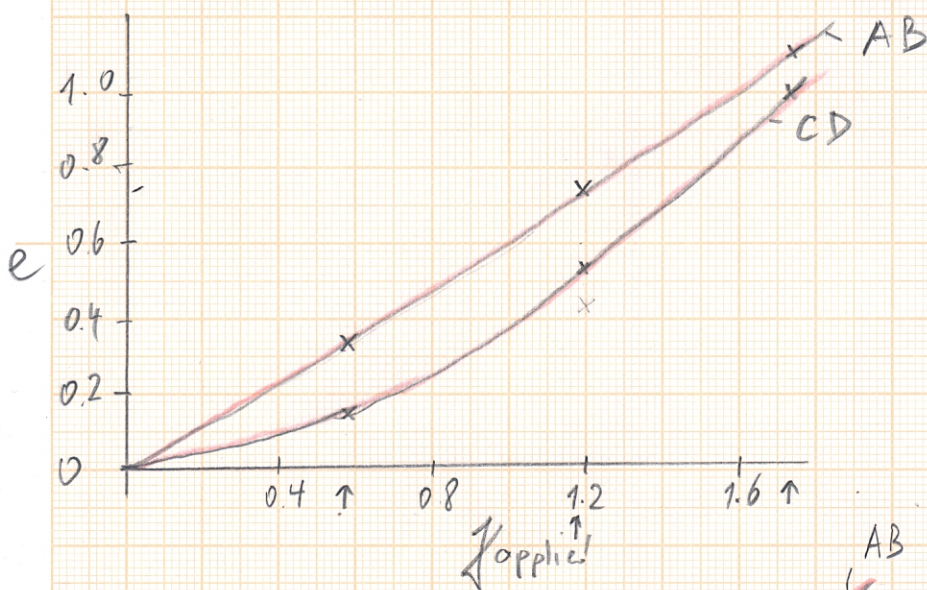
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Bonus questions:

1. What is the average thickness of continental crust? *30-35 km*
2. What is the main geological reason for rapid changes in the sea-level? *glaciation*
3. What are the two most common elements in the crust? *O, Si*
4. What happened on Earth 66 million years ago? *meteor impact*

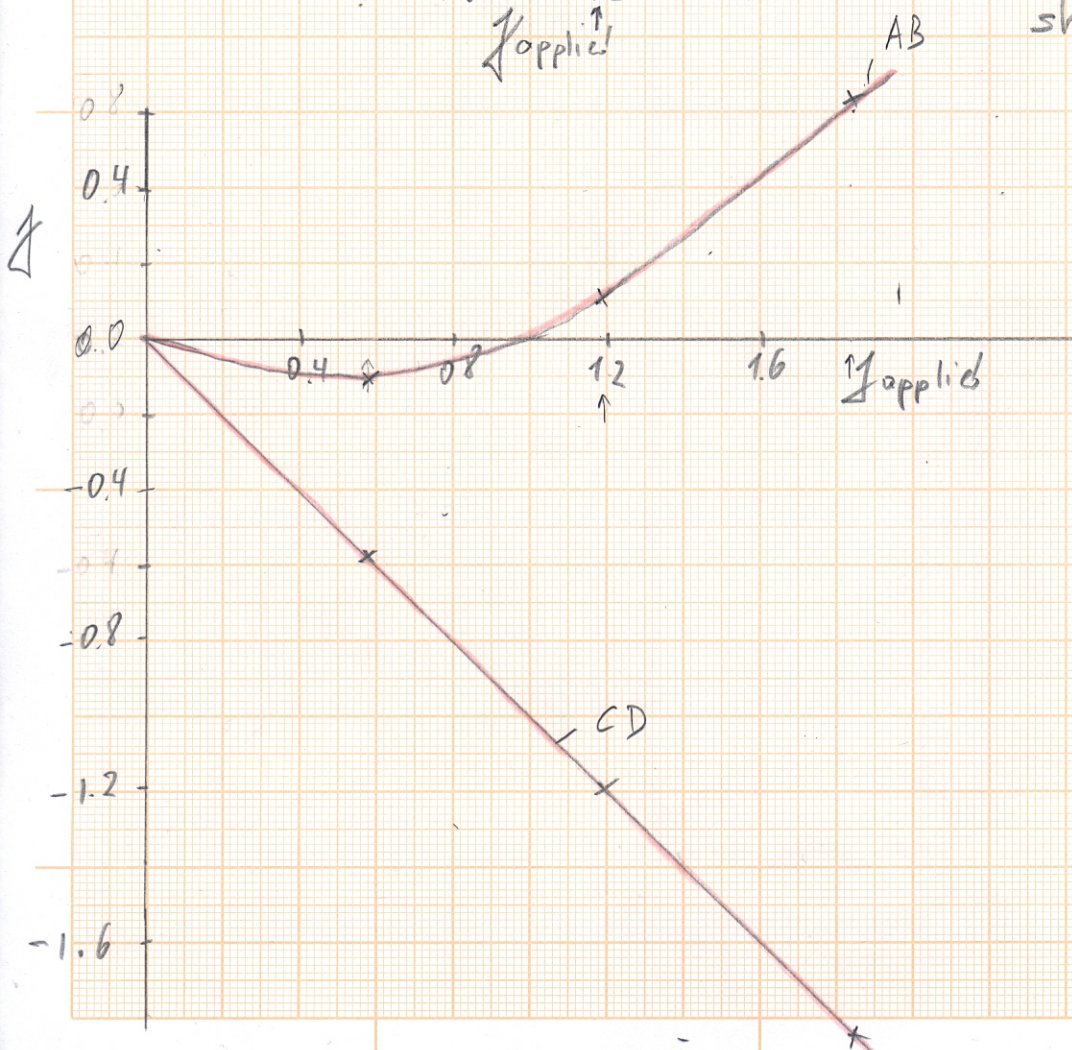
3) a)

	$\psi$	$f$	AB mm	$e_{AB}$	CD mm	$e_{CD}$	$\psi_{AB}$	$f_{AB}$	$\psi_{CD}$	$f_{CD}$
I	0	0.00	27	0.00	26	0.00	0	0	0	0
II	30	0.58	36	0.33	30	0.15	$-6^\circ$	0.11	$-30$	$-0.58$
III	50	1.19	47	0.74	40	0.54	$+6.5^\circ$	0.11	$-50$	$-1.19$
IV	60	1.73	57	1.11	52	1.00	$32$	$0.63$	$-60$	$-1.73$



$$b) e_i^{AB} = \frac{47-36}{36} = 0.305$$

c) shear strain along CD is the same as applied shear strain because line CD is perpendicular to the shear direction



$$d) e_{CD}^{II-IV} = \frac{52-30}{30} = 0.73$$

$$\dot{\epsilon} = \frac{e}{t} = \frac{0.73}{2 \times 60} \text{ s}^{-1}$$

$$= 0.0061 \text{ s}^{-1}$$

$$= 6.1 \times 10^{-3} \text{ s}^{-1}$$

