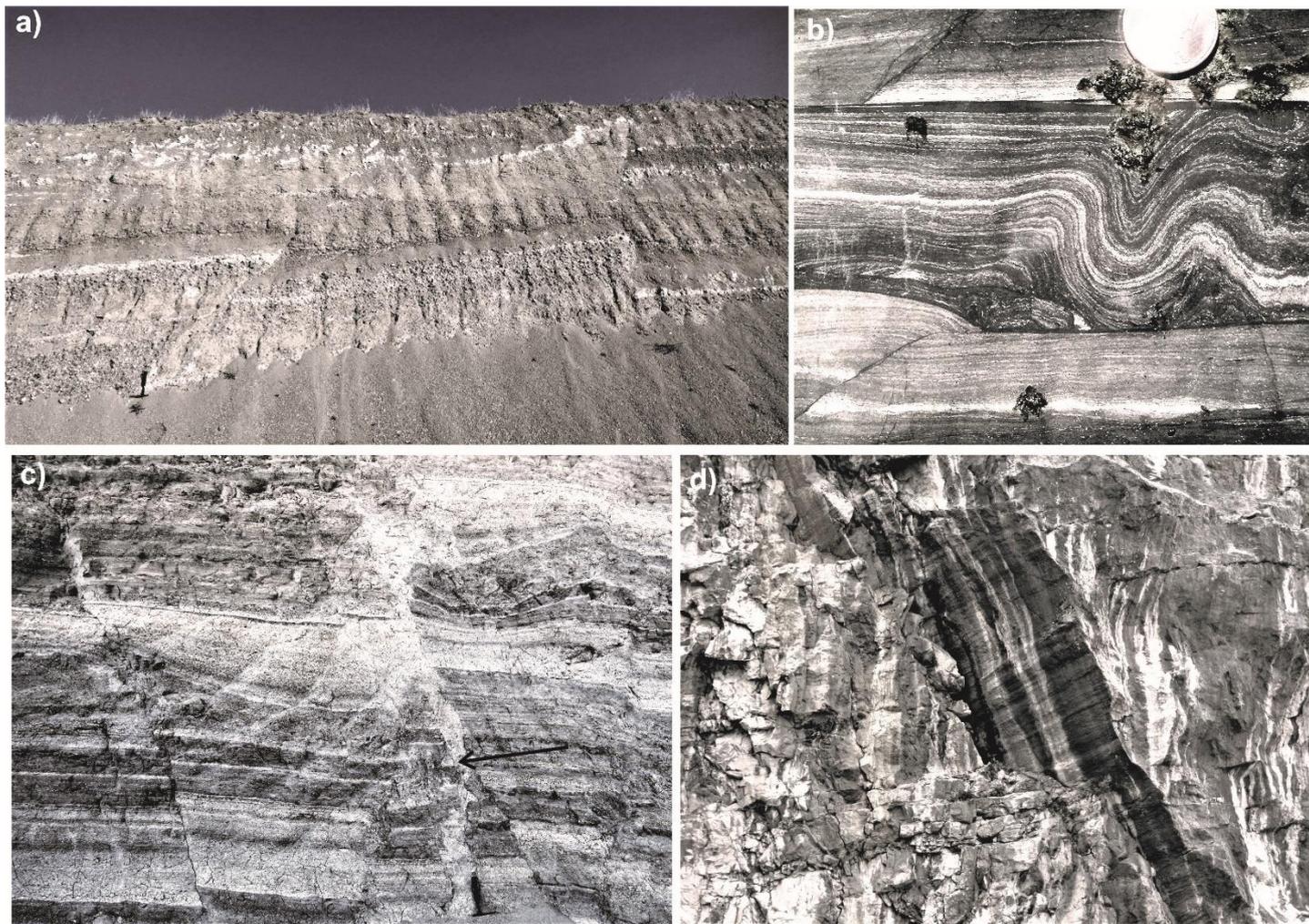


**STRUCTURAL GEOLOGY**  
**Final Exam Questions**  
**5th June 2018**

1. Shown below are photographs of faults and folds from four different regions.

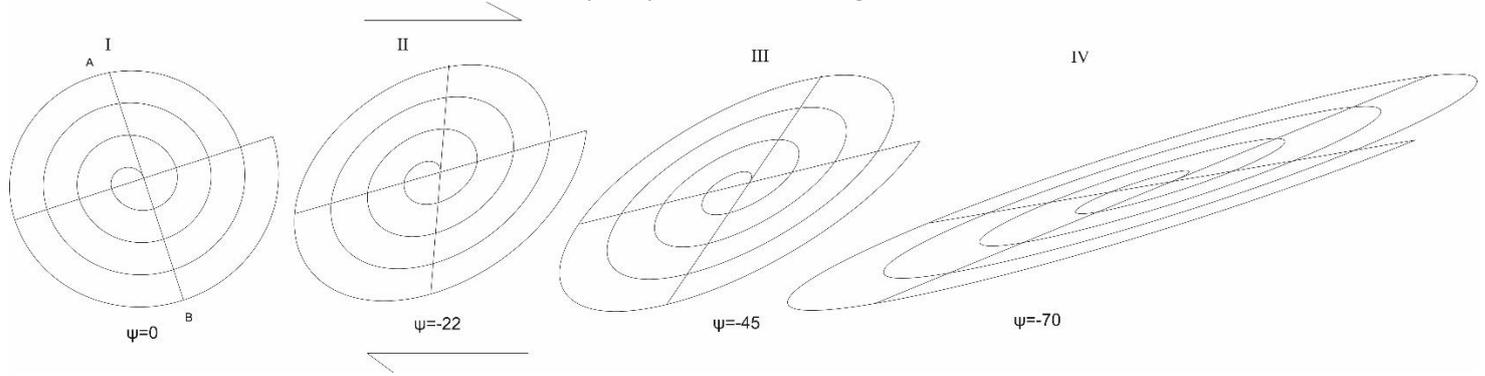
- a) Draw the faults on the photos, and explain on the answer sheet the type of faulting and the amount of offset, providing reasons for your answers.
- b) Explain on the question and answer sheets the type of folds in (b) (anticline, syncline, parallel or similar), again providing reasons for your answers.
- c) Can you suggest a reason as why folding in (b) does not effect the underlying and overlying sheets?
- d) What sort of information on the type of faulting can be obtained from the fault plane shown in (d).
- e) Can you say something about the age of faulting in (a). This photo is taken close to Ankara, what can you infer about the tectonic regime around Ankara (strike-slip, extension or shortening).
- f) What is the structure shown by an arrow in (c)?



2. Define and explain the following terms with the help of diagrams:

stress, strain, elastic limit, ductile-brittle transition, cleavage, transtension, mineral lineation, boudinage

3. The foraminifera shown below is deformed by simple shear with angular shear strain values shown.



- Calculate the longitudinal and angular changes along the line AB, and show them on  $e-\gamma$  and  $\gamma-\gamma$  diagrams.
- What are the **incremental** longitudinal strains along the line AB between stages III and IV?
- Calculate approximate ellipticities  $R$  for each stage, and show them on  $R-\gamma$  diagram.
- Assuming that the line AB is deformed in 2 minutes between the stages II and IV, calculate the strain rate.

4. The orientation of two conjugate faults are: 10/30E and 25/25NW

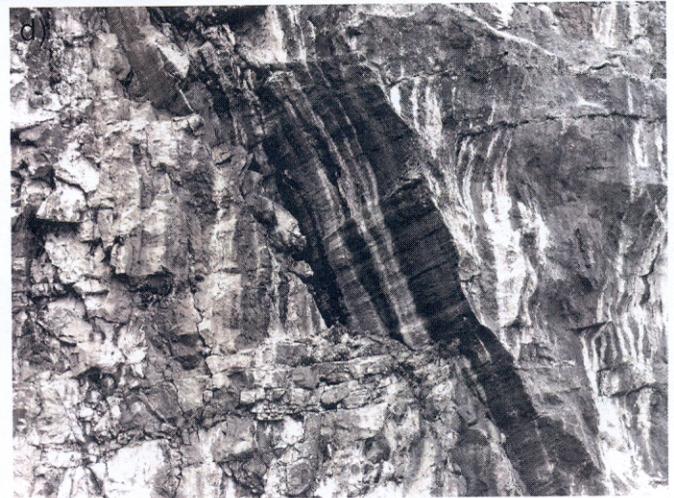
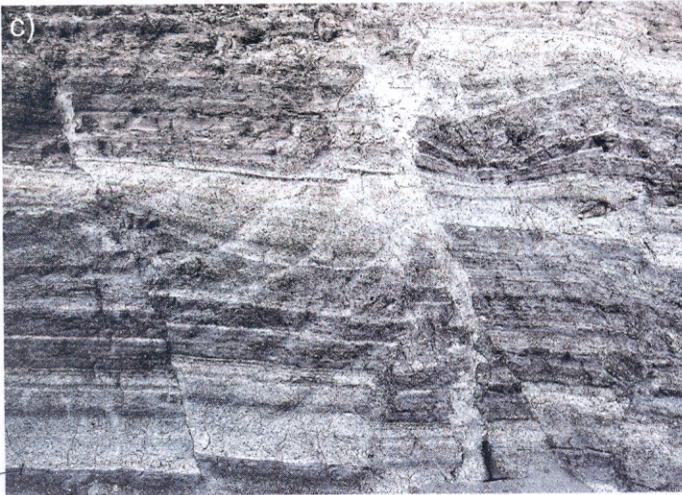
- Plot the faults on a stereographic projection as great circles ( $\beta$ -diagram).
- Show the principal stress directions  $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$  on the projection.
- Find out the trend and plunge of  $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$ .
- Find out the angle between the conjugate faults.
- What is the type of faulting? Give reasons for your choice.

#### Bonus questions

- What is the main rock type at the İTÜ Maslak campus?
- What is the approximate depths of crust-mantle transition under Istanbul?
- What is the maximum depth of the Bosphorus straits?
- What is the main mineral and rock type in the upper mantle?
- What is the main rock type on the floors of the Sabiha Gökçen airport?

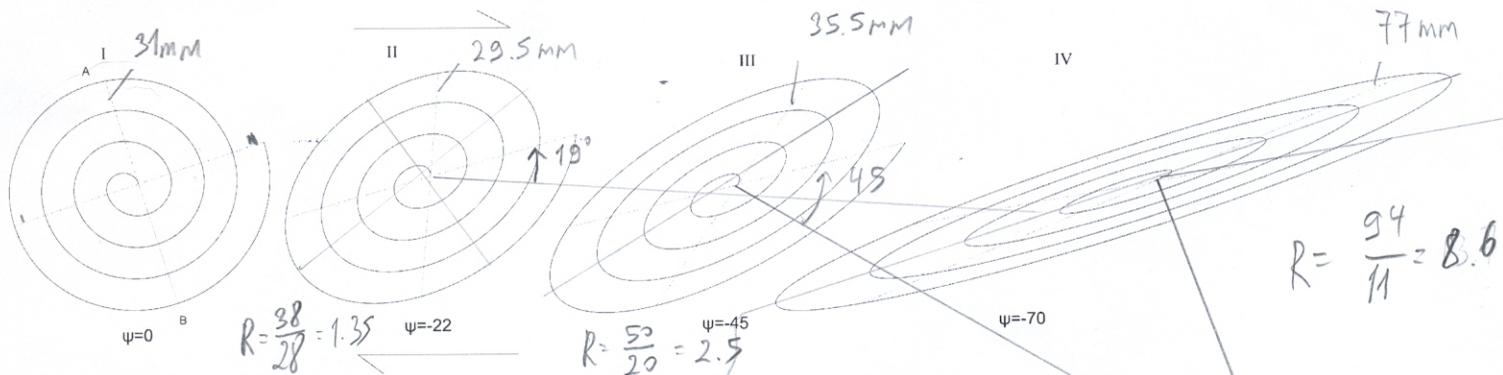
**STRUCTURAL GEOLOGY**  
**Final Exam Questions**  
**5th June 2018**

1. Shown below are photographs of faults and folds from four different regions. Draw the faults on the photos, and explain the type of faulting and the amount of offset on the answer sheet, providing reasons for your answers. Explain the type of folds in (b) (anticline, syncline, parallel or similar) on the question and answer sheets. Can you suggest a reason as why folding in (b) does not effect the underlying and overlying sheets? What sort of information can be obtained from the fault plane shown in (d).



2. Define and explain the following terms with the help of diagrams: stress, strain, elastic limit, ductile-brittle transition, cleavage, transtension, mineral lineation, boudinage

3. The foraminifera shown below is deformed by simple shear with angular shear strain values shown.



- Calculate the longitudinal and angular changes along the line AB, and show them on e- $\gamma$  and  $\gamma$ - $\gamma$  diagrams.
- What are the **incremental** longitudinal strains along the line AB between stages III and IV?
- Calculate approximate ellipticities R for each stage, and show them on R- $\gamma$  diagram.
- Assuming that the line AB is deformed in 2 minutes between the stages II and IV, calculate the strain rate.

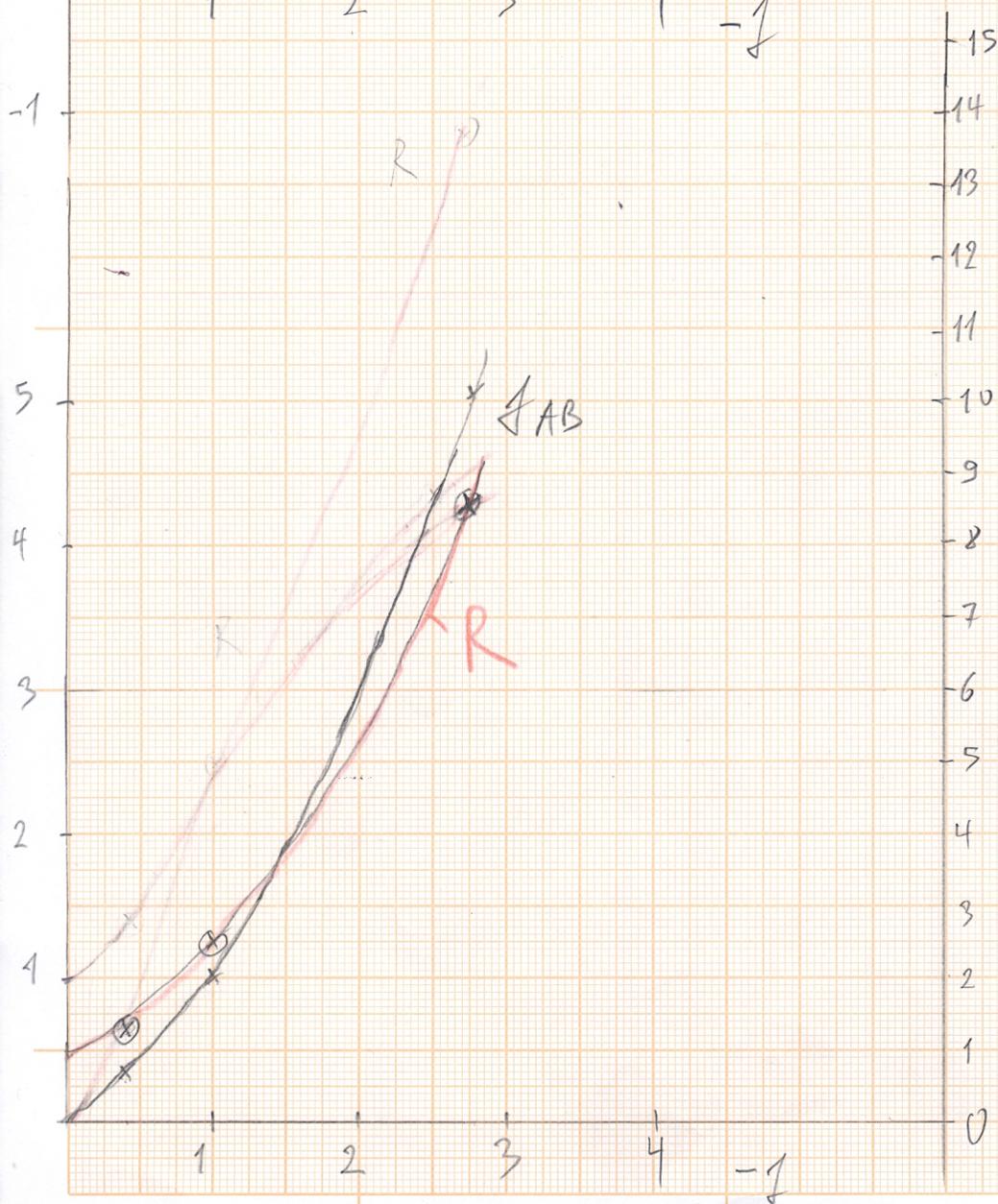
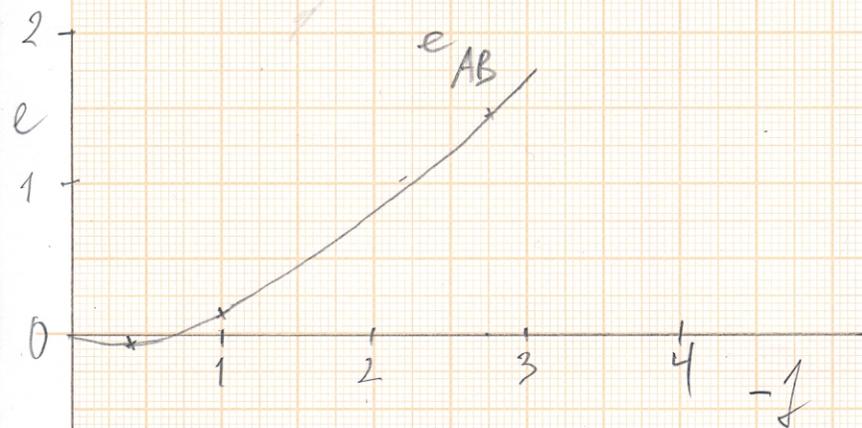
3.	$\psi$	$\delta$	AB	$e_{AB}$	$\psi_{AB}$	$\delta_{AB}$	R
	0	0	31 mm	0	0	0	0
	-22	-0.40	29.5	-0.05	19	0.34	$\sim 1.35$
	-45	-1	35.5	0.145	45	1.00	$\sim 2.5$
	-70	-2.75	77.0	1.48	79	5.14	$\sim 18.6$

b) incremental strain

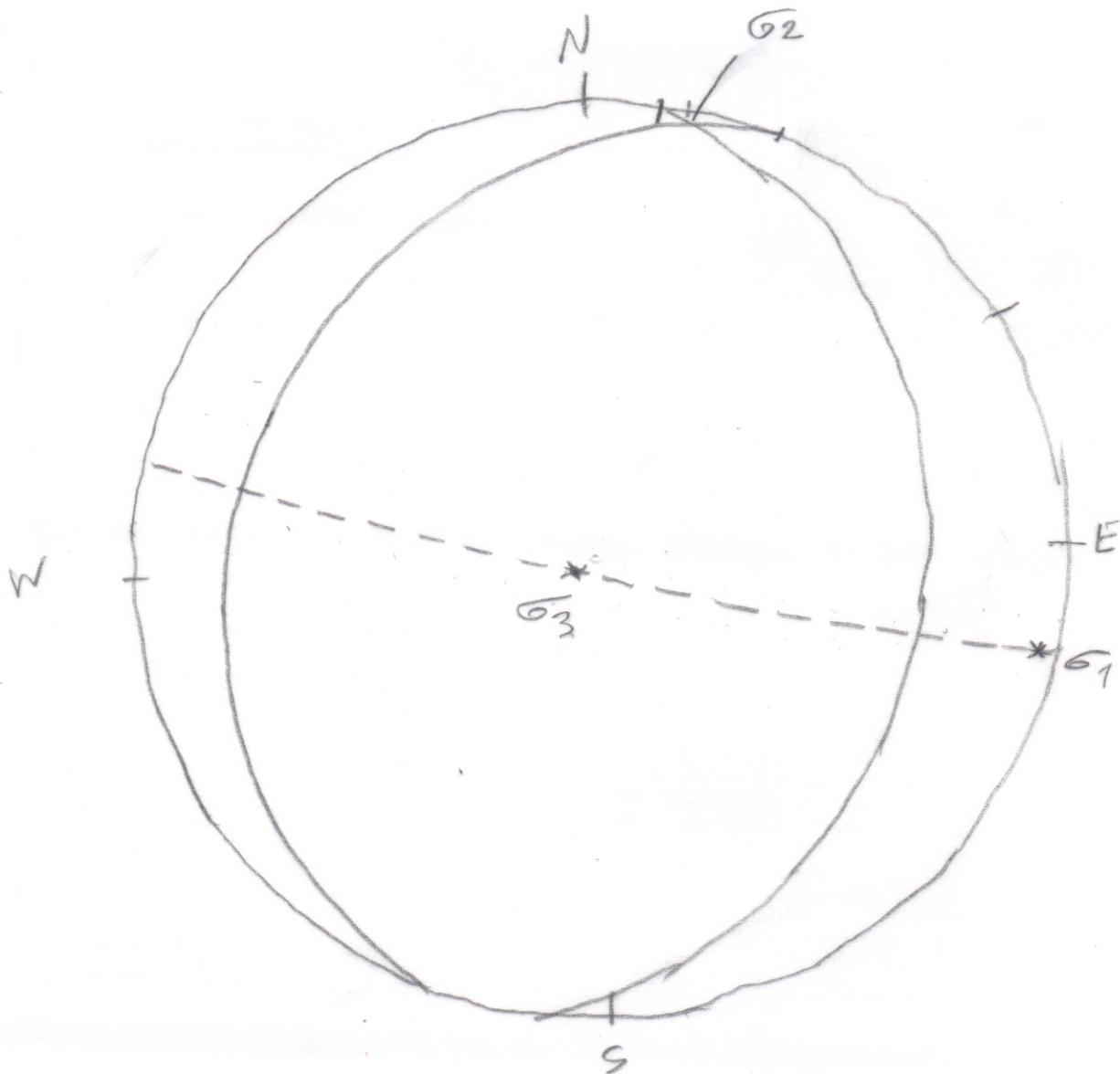
$$e_{AB}^{III-IV} = \frac{77 - 35.5}{35.5} = 1.17$$

d)  $e_{AB}^{II-IV} = \frac{77 - 29.5}{29.5} = 1.61$

$$\dot{e} = \frac{1.61}{720s} = 0.013 s^{-1}$$



question 4



$\sigma_1$  104/03 E  
 $\sigma_2$  14/03 NE  
 $\sigma_3$  60/86 SW

angle between faults  $\approx 126^\circ$