

National Exams May 2011

04-Geol-A3, Sedimentation & Stratigraphy

3 hours duration

INSTRUCTIONS FOR CANDIDATES

1. This is an **OPEN BOOK** examination. Candidates are encouraged to fully understand the intent and scope of the questions before attempting to answer them.
2. Answer Question No. 1 (compulsory) and any four others. FIVE (5) questions constitute the examination paper. All questions are of equal value (20 marks each). The first five questions as they appear in the answer book will be marked.
3. Any assumptions made in the interpretation of a question should be clearly stated in the answer.
4. Clarity and organization of the answers, including legible handwriting, are important.
5. The use of freehand sketches and tables to augment or organize answers is encouraged.
6. A non-communicating calculator is permitted.

**THIS EXAMINATION PAPER CONSISTS OF TWO (2) PAGES,
INCLUDING THIS COVER PAGE**

QUESTIONS (Answer Question No. 1 and any four others)

- 1) [20 marks] Write an essay of at least five hundred words on the relevance of this course (04-Geol-A3 Sedimentation and Stratigraphy) to geological engineering. Cite examples in support of your viewpoint.
- 2) [20 marks] Two sites are competing for a hydroelectric dam. Site A is in a valley incised into a predominantly argillaceous shale rock formation. Site B is located in an unconformity of thickly bedded dolomite overlying soluble limestone bedrock at the base of the valley. Do these sites face geological engineering problems, and if so, what might they be? Provide reasons if your answer is affirmative.
- 3) [10 marks for each of Parts (a) and (b)]
 - a. Compare and contrast mud flow, debris flow and turbidity currents.
 - b. A mature river has a cross-sectional area of 500 m^2 in a channel width of 80 m.
 - (i) What maximum flow velocity will tend to create backwater effects?
 - (ii) Calculate the flow velocity required to equal wave celerity.
 - (iii) How is bed form affected by stream velocity?
- 4) [4 marks per correct answer for a total of 20 marks] Define or briefly describe, with sketches as appropriate, any five of the following:
 - a. Diagenesis
 - b. Allochems
 - c. Arkose
 - d. Wadi
 - e. Esker
 - f. Oolite
 - g. Stalagmite
 - h. Turbidites
- 5) [10 marks for each of Parts (a) and (b)]
 - a. What are evaporates and why are they significant in the geological record?
 - b. Give two examples each of clastic, non-clastic and biochemical sediments. Explain their classification and modes of formation and briefly comment on their engineering properties such as strength and deformability.
- 6) [20 marks] Write a short essay (300-500 words) on the formation of so-called "quick" (or sensitive) clay sediments found in many parts of Norway, Sweden and Canada, including their depositional environment and, in more general terms, their post-depositional engineering properties.

END OF EXAM PAPER