

## National Exams December 2017

### 04-Geol-B4 Geomorphology and Pleistocene Geology

3 hours duration

80 marks

#### **NOTES:**

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM.
3. No calculators or electronic aids are permitted.
4. Answers must be written on the exam pages.
5. Clarity in writing and organization of the answers are important.
6. The exam consists of three parts (Parts 1, 2, and 3).

**Part 1.** Multiple choice questions: answer any 10 questions by clearly circling your choice, if more than 10 are answered **only the first 10 choices will be marked.**  
(2 ea = 20 marks for part1)

- 1.1 The 'A' horizon or upper zone of a pedifer is the major zone of:  
(A) eluviation, (B) illuviation, (C) lithification, (D) progradation, or (E) transpiration.
- 1.2 For cirque glaciers, the zone of ablation is normally separated from the zone of accumulation by the: (A) the bergschrund, (B) the end moraine, (C) the dolin, (D) the firn line, or (E) the snow limit.
- 1.3 The theoretical lower limit to vertical erosion by a river, is known as: (A) baseflow, (B) base level, (C) recession limb, (D) stream boundary, or (E) competence.
- 1.4 In the following list, which is NOT a variable in slope stability as expressed in the Coulomb equation? (A) normal stress, (B) pore pressure, (C) cohesion, (D) angle of internal friction of the material, or (E) total relief.
- 1.5 In a stream hydrograph the relatively constant value of a minimum level of discharge is known as: (A) baseflow, (B) base level, (C) recession limb, (D) stream boundary, or (E) competence
- 1.6 The relationship between sediment grain diameter and stream velocity that delineates critical values for erosion, transportation and deposition, is called:  
(A) the Davis model, (B) the Gilbert model (C) the Hjulström diagram, (D) the Sugden model, or (E) the Schumm equilibrium equation.
- 1.7 The depositional process which occurs most often for fine-grained sediment in a glacial marine environments is called: (A) terminal settling, (B) siltation, (C) saltation, (D) flocculation, (E) eluviation
- 1.8 In permafrost regions, the zone near the surface that alternately freezes and thaws annually is called: (A) the active layer, (B) discontinuous permafrost, (C) the firn layer, (D) the plastic zone, or (E) scree.
- 1.9 The term for the flat surfaces that can be found on pebbles or cobbles is called:  
(A) encores, (B) facets, (C) loess, (D) stosses, (E) tilites.
- 1.10 The rise and fall of world-wide sea level during glacial cycles is called:  
(A) refraction, (B) neap, (C) mass balance, (D) isostasy, or (E) eustacy.
- 1.11 Channelization most often leads to: (A) formation of distributaries, (B) formation of wadis, (C) increased downstream erosion, (D) reduced upstream deposition, (E) stream piracy.
- 1.12 The previous interglacial period when temperatures were as warm as present was called the: (A) Cordilleran, (B) Holocene, (C) Huronian, (D) Sangamon, (E) Wisconsinan.

**Part 2. Short Essay Questions: Answer any 8 out of 10 questions, only the first 8 answers will be marked (5 ea = 40 marks for part 2.0).**

2.1 There are two schools of thought concerning the emphasis of major processes and/or elements in geomorphology research. Identify the schools of thought or who championed the idea, and what elements are emphasized in each paradigm.

2.3 What are the five common factors that influence soil formation extent and type and how do the factors influence pedogenesis?

2.3 Identify the five erosional agents of change in geomorphology. Cite an example of how each agent acts to influence the landscape development and explain how the agent is involved.

2.4 Glaciation of a region results in profound changes to underlying materials and topography. Discuss five (5) of the possible topographical or material changes that may be of concern to engineers about to explore a site for foundation development.

2.5 Give five (5) geomorphic factors that control sediment erosion on slopes and indicate how each contributes to increase or decrease erosion.

2.6 Discuss how waves influence the morphology of coasts.

2.7 Why do glaciers advance or retreat and what surface features (i.e. landforms) indicate which has occurred?

2.8 Urbanization or deforestation can result in significant changes to the drainage of an area that can be recognized in a stream hydrograph measured at a gauging station located down-stream of the site of activity. Discuss some of the likely major hydrological changes that might occur.

2.9 Compare and contrast mud flow, grain flow and turbidite deposits.

2.10 Weathering often produces secondary products that are more stable than the original mineral. Give examples of the two common types of secondary weathering products and examples of their most stable secondary compounds.

**Part 3** Answer in point form all parts (20 mks total, **each count for different marks**).

3.1 A drainage pattern often indicates certain terrain conditions, such as a physical property homogeneity, thickness, or some other condition of the surficial deposits. Indicate what geological conditions are likely represented by the following drainage patterns.

(A) Rectangular (2 mks)

(C) Multibasinal (2mks)

3.2 (A) Give two (2) glacial landforms that would likely be formed of well sorted sand and gravel. (2mks)

(B) Give two (2) characteristic properties that are common features of basal till. (2mks)



- 3.3 Areas of distinctive topographic profiles can indicate their likely agent of formation as well as subsurface materials or conditions. What are three (3) possible origins that could result in a flat topographic plain covering a wide area on an air photograph and what is a distinctive characteristic of each that differentiate between the possible origins. (6mks)
- 3.4 Deep river valleys in glaciated mountainous areas can present serious hazards to roads occurring along the valley bottom. Indicate three potential hazards that you could look for on aerial photographs and the geomorphic features that would indicate the hazards are occurring. (6mks)