National Exams **December 2014**

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. The exam consists of three parts (Parts 1, 2, and 3).
5. This exam consists of 10 questions from Part 1 (20 mks), 8 questions from Part 2 (40 mks) and all 4 questions from Part 3 (20 mks); a complete exam paper counts for a total of 80 marks.
6. In Part 1, 11 multiple choice questions are asked, any 10 are to be completed.
7. Where all 11 are answered only the first 10 completed answers will count.
8. All questions within Part 1 are of equal value (2mks ea).
9. In Part 2, 10 short essay questions are asked and any 8 are to be completed; use the back of the preceding page if you need extra room for an answer and indicate that this has been done with a note at the question and the question number by the answer.
10. Where more questions have been answered only the first 8 answers will be marked.
11. All questions within Part 2 are of equal value (5 mks each).
12. In Part 3 all questions must be answered and the questions are of different values as indicated in the section heading.
13. Clarity in writing and organization of the answers are important.

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 zone in which elements are accumulated after removal from an overlying horizon during soil formation, is called the zone of: (A) eluviation, (B) illuviation, (C) lithification, (D) progradation, or (E) transpiration.

1.2 In a stable glacier with a neutral mass balance, which of the following terms closely separates the zone of ablation from the zone of accumulation? (A) the bergschrund, (B) the end moraine, (B) the dolin, (D) the firn line, or (E) the snow limit.

1.3 Which is NOT a variable in slope stability as expressed in the Coulomb equation? (A) slope, (B) pore pressure, (C) total relief, (D) angle of internal friction of the material, or (E) cohesion.

1.4 In a stream hydrograph the relatively constant value of a minimum level of discharge is known as: (A) baseflow, (B) base limit, (C) recession limb, (D) stream boundary, or (E) competence.

1.5 Depression of the crust under the weight of a glacier is called: (A) eustacy, (B) isostacy, (C) mass balance, (D) neap, or (E) refraction.

1.6 The relationship between sedment grain diameter and stream velocity that delineates critical values for erosion, transportation and deposition, is called: (A) the Davis model, (B) the Hjulström diagram, (C) the Strahler's system, (D) the Sugden model, or (E) the Schumm equilibrium equation.

1.7 Which landform **is not** paired up with material that typically dominates the strata that occurs within that landform? (A) abyssal plain: clay, (B) barchan: sand, (C) kame: stratified drift, (D) debris fan: well-sorted silt, or (E) moraine: till.

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 Flocculation is a process that occurs most often in: (A) barchan deposits, (B) ice-contact deposits, (C) glacilacustrine deposits, (D) glacimarine deposits, or (E) aeolian deposits.

1.10 Exposed tracks of Sharp jagged limestone ridges are examples of : (A) dolins, (B) dripstone, (C) karren, (D) travertine, or (E) yardangs.

1.11 Long linear, tabular or wedge-shaped accumulations of shingled course clasts are more likely characteristics produced in depositional environments or landforms, such as: (A) beaches, (B) debris flows, (C) eskers, (D) permafrost surfaces, or (E) solifluction lobes.

Part 2. Short Essay Questions: Answer any 8 out of 10 questions,
if more than 10 are answered 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, who championed the idea, and what elements are emphasized in each paradigm.

2.2 What are the five factors that influence soil formation and how do the factors influence pedogenesis?

2.3 Identify the five 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 Why do different glaciers produce different types of landforms?

2.6 Explain how braided river deposits differ from meandering river deposits and discuss the geomorphic processes or factors that are responsible for these differences.

2.7 Discuss how waves influence the morphology of coasts.

2.8 Why do glaciers advance or retreat.

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

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

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 property homogeneity, thickness, or some other condition of the surficial deposits. Indicate what geological conditions are likely represented by the following drainage patterns.

(A) Dendritic (2mks)

(B) Trellis (2 mks)

(C) Multibasinal (2mks)

3.2 Give four (4) landforms that could would likely be formed of well sorted sand and gravel.

(4)

3.3 Areas of distinctive topographic profiles can indicate their likely agent of formation as well as subsurface materials or conditions. What possible origins could result in a flat topographic plain covering a wide area on an air photograph and what characteristics could you look for to help you differentiate between the possible origins.

3.4 You have been asked to examine some air photos showing a river valley with surrounding high relief on each side. What geomorphic features could you look for to indicate potential hazards to activities that might occur along the valley bottom.