UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV. – DEC. 2018

COURSE NO: GL 473

COURSE NAME: Engineering Geology

CLASS: GL IV **TIME: 2 hours**

Name: _____ Index Number: _____

Please answer all questions from both sections. Read every question carefully and circle/ underline the correct answer or supply the correct answer to the spaces provided. Note that a <u>false guess</u> in the True/False section will attract a negative halve (-1/2) from your accrued marks.

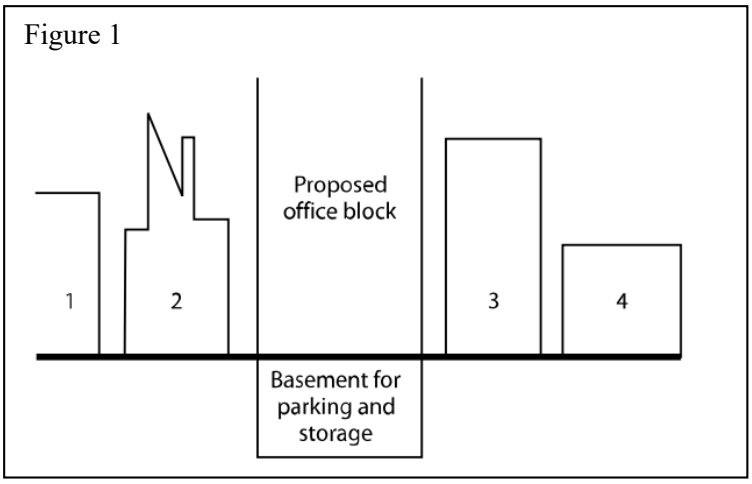
<u>Section A</u>

Use this information to answer question 1 in section A. As an engineering geologist, your task is to investigate the suitability of the ground for a design of 10-storey office complex with a basement as in Figure 1. The information available to you from desk study are

a) Buildings 1 and 3 are new, Building 4 is modern but older, and Building 2 is very old, structurally suspect and of importance historically. b) Bedrock (unknown depth) in the general area is granite, characterized by some weathering and with numerous faults and shear zones. The overburden is composed of normally consolidated alluvium; groundwater is shallow. Nothing is known about the geological conditions or foundations underneath building 2. Records of old boreholes exist for Building 4(unknown foundations, and both investigation records and as-built foundation drawings exist for Buildings 1 and 3. The groundwater level is also very high.

Discuss in detail, and build arguments that would help you with conceptual model of the proposed building, assuming there is no possibility of re-settlement of any of the buildings in close proximity? Note your submission should be tailored around engineering site investigation concepts. [20 mrks]

Figure 1



Section B

1. The reliability of topographical maps as base maps as well as other maps used for engineering geological mapping primarily depends on its …….
2. Where projects are planned on such a large scale that they span across various geological formations, what type of map is needed? …….
3. This map is designed for use in regional and local planning, for example in the location of areas suitable for housing and recreational facilities, and the selection of sites for waste disposal?
   ……..
4. The most useful type of map for providing rock masses or rock construction materials?
   …….
5. Topographic map scales commonly available in Ghana are 1:20000; 1:50000; 1:65500; 1:5000 and 1:200000. Which of these is the smallest scale? ……..
6. Which of these cement and road aggregates tests generally give a useful index of the overall structural integrity of the aggregates?
   A. LAAT B. ACV C. ACT D. 10 % FACT E. PLT
7. Which of these statements is true about earthquakes?
   A. Faults are caused by earthquakes B. Earthquakes are driven by mantle convection
   C. Earthquakes displays linear behaviour D. Earthquakes are caused by faults
8. What test is used to determine the presence of sulphate minerals and of amorphous silica?

……

9. In engineering geology, observations, measurements and factor of safety analysis is primarily adopted to prevent what? ……
10. This is a term given to the interconnected pore volume or void space in a rock that contributes to fluid flow or permeability in a geologic material……..
11. The elastic limit, where elastic deformation changes to plastic deformation is termed the
    ……..
12. In the determination of mechanical strength of concrete aggregate mix, the rock mass must be
……..……. graded
13. During the setting or hardening of concrete, hydration of the cement takes place which results in *what* being released? ……
14. In the determination of the strength of concrete aggregate, the relative sizes and shapes should be well graded. [T / F]

15. Tests to determine the presence of sulphate, sulphide and siliceous minerals are only carried out in chemical analysis. [T / F]
16. The degree of interlocking is the minor factor that determines the strength and competency of the rock unit? [T / F]
17. One of the shortcomings of geological map from the engineering geologist's perspective is the lack of qualitative information on the physical properties of the rocks, the amounts and types of discontinuities present, the extent of weathering, and groundwater conditions, as well as the physical properties of the rocks themselves. [T / F]
18. The structure of a rock refers to individual grain characteristics in the rock (the alignment of the grains is referred to as the rock fabric and this should show preferred orientation). [T / F]
19. Reduction of pore fluid pressures causes decrease in the effective stresses, geologic masses consolidate, resulting in surface subsidence. [T / F]
20. In concrete aggregate mix, using 60 % rounded, 15 % sub-rounded and 20 % sub-angular shapes will result in a better tenacity of the bonding. [T / F]
21. Chalcedonic silica (flint, chert, agate) and glassy siliceous rocks (rhyolite, pitchstone) are often desirable in gravel aggregate since they react with highly alkaline cements. [T / F]
22. Mineralogy plays an important role in road stone aggregates because it is the basic factor which affects durability. Generally, this mineralogical durability follows roughly the Bowen's reaction series. [T / F]
23. In the mechanical stability of the aggregate, degree of alteration could improve skid resistance. [T / F]
24. Higher Los Angeles Abrasion values indicate aggregate that is tougher and more resistant to abrasion. [T / F]
25. 'Hazards' are either natural or man-made processes that have the potential to cause destruction, whether humans are threatened or not. [T / F]
26. There are two main causes that may undermine the tenacity of cement-aggregate bond

A. …….

B. ……..……

27. Rocks used as concrete aggregates should meet about five (5) engineering characteristics, what are these engineering characteristics?

A. ……
B. ……
C. ……
D. ……
E. ……

28. The process of surface withdrawal of support in engineering project may result in

A. ……

B. ……

C. …….....

29. When underground supports are withdrawn by the excavation of tunnels, chambers or mines, the results may include the following:

A. …….

B. …….

30. In evaluating the suitability of a project site, what are the main basic steps an engineering geologist MUST undertake?

A. ……..

B. …….

C. …….. …….

F. Majeed / Prof. J. S. Y Kuma