INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

DEPARTMENT OF CIVIL ENGINEERING

PROGRAMME: CIVIL ENGINEERING

BCE2206: ENGINEERING GEOLOGY

YEAR/SEM **:** Two (2), Semester II

DATE: 24/04/2025 **TIME: 09:00 AM – 12:00 Pm**

INSTRUCTIONS TO CANDIDATES:

1. THIS EXAMINATION CONSISTS OF TWO SECTIONS; SECTION A AND SECTION B.
2. ATTEMPT ALL QUESTION IN SECTION A
3. AND FOUR (4) QUESTIONS FROM SECTION B.
4. DO NOT OPEN THIS EXAMINATION UNTIL YOU ARE TOLD TO DO SO
5. ALL ROUGH WORK SHOULD BE IN YOUR ANSWER BOOKLET
6. THE TIME ALLOWED FOR THIS EXAMINATION IS STRICTLY THREE HOURS
7. ON THE FIRST PAGE OF YOUR ANSWER BOOKLET
    - WRITE YOUR REGISTRATION NUMBER PROPERLY
    - WRITE THE COURSE NAME AND COURSE CODE
    - WRITE EXAMINATION VENUE
    - DO NOT WRITE, DRAW OR SCRATCH ANYTHING ELSE ON THE FIRST PAGE
    - WRITING UNNECESSARY INFORMATION LIKE PHONE NUMBERS IN THE FIRST PAGE SHALL ANNUL YOUR EXAM

ANSWER BOOKLETS THAT DO NOT CARRY THE REQUIRED INFORMATION, OR THAT HAVE UNNECCESSAY WRITING IN THE FIRST PAGE SHALL NOT BE

SECTION A: COMPULSORY

1. What is the thickness of the crust under the mountainous areas and in particular the Himalayas?

   A. 50-55 km
   B. 60-65 km
   C. 70-75 km
   D. 30-35 km

2. Which of the following is not true about Asthenosphere?

   A. It is present in the upper mantle
   B. It is in solid state
   C. It is the source of volcanic activity
   D. It is in plastic rather than solid state

3. Which of the following is true about the inner core?

   A. It is believed to be a semi solid body
   B. It is believed to be a solid body
   C. It is believed to be a liquid body
   D. It is believed to be a gaseous body.

4. The layer which does not transmit the S-waves is _____

   A. Outer core
   B. Crust
   C. Mantle
   D. Inner core

5. The layer which is said to support the slow-moving tectonic plates is _____

   A. Asthenosphere
   B. Lithosphere
   C. Mohorovic sphere
   D. Core layer

6. Which of the following about weathering is not true?

A. It is a natural process
B. Mechanical disintegration is involved
C. Chemical decomposition is involved
D. It is a rapid process

7. The stress developed in the top layers of the rocks which disintegrate due to repeated variations in temperatures is _____

A. Tensile stress
B. Compressive stress
C. Shear stress
D. Bending stress

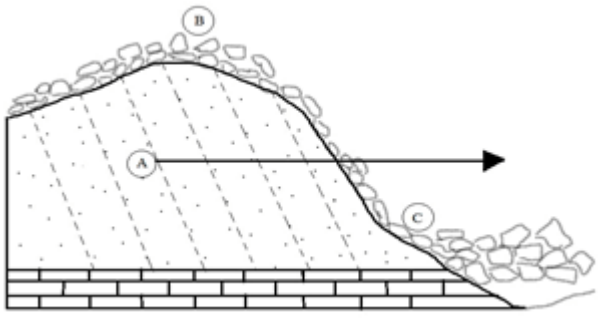
8. Which of the following facts about Exfoliation is false?

A. It is the phenomenon of peeling off of curved shells from rocks
B. The change is accompanied by chemical weathering
C. Internal structure of the rock is affected
D. It occurs in thick or layered rocks.

9. The process that is not considered under mechanical weathering is _____

A. Carbonation
B. Temperature variation
C. Unloading
D. Insolation

10. Identify the part labelled as “A” in the below diagram.



A. Weathered rock

B. Parent rock
C. Rolled down rock
D. Powdered rock

11. The type of erosion which involves rubbing, grinding is _____

A. Deflation
B. Attrition
C. Deflection
D. Wind abrasion

12. The stress developed in the top layers of the rocks which disintegrate due to repeated variations in temperatures is _____

A. Tensile stress
B. Compressive stress
C. Shear stress
D. Bending stress

13. What is responsible for jointing of rocks?

A. Genesis
B. Forces acting on the rock
C. Genesis and various forces acting on the rock
D. Precipitation

14. Fractures along which there has been no relative displacement is called?

A. Faults
B. Joints
C. Folds
D. Intrusions

15. What is the process of movement downwards of vadose water called?

A. Infiltration
B. Filtration
C. Deposition

D. Down-flow

16. Which of the following is not true about a mineral?

A. Naturally occurring
B. Inorganic substance
C. Organic substance
D. Definite chemical composition

17. When the joints are prominent and extending for considerable depth they are called _____

A. Continuous joints
B. Discontinuous joints
C. Deep joints
D. Prominent joints

18. Colour of a mineral depends upon its?

A. Atomic structure
B. Outer surface
C. Composition
D. Atomic structure and composition

19. What is the pressure of upper surface of unconfined aquifer?

A. Very high pressure
B. Lower than atmospheric pressure
C. Equal to atmospheric pressure
D. Greater than atmospheric pressure

20. Storage capacity of a reservoir depends on _____

A. Porosity of rocks
B. Inter-connections
C. Quality of solidity of rocks
D. Porosity and inter-connections

SECTION B

ATTEMPT ANY FOUR QUESTIONS FROM SECTION B

QUESTION ONE

a) Tunneling is often preferred over other excavation methods in infrastructure development. Discuss the key advantages of tunneling (5mks)

b) Engineers often face critical decisions when choosing between open cuts and tunnels for infrastructure projects. Analyze the key geological, environmental, and economic factors that influence the selection of either method. Discuss the engineering challenges associated with each approach and propose strategies to mitigate potential risks during construction. (15mks)

QUESTION TWO

a) Select any three common minerals and describe their physical (e.g., hardness, cleavage) and chemical properties. Relate these properties to their practical applications in engineering. (10mks)

b) The Earth's crust is constantly shaped by tectonic forces, leading to the formation of different types of folds. Describe the major types of folds, explaining their distinguishing features and formation processes. How do these folds influence geological stability and engineering projects? (10mks)

QUESTION THREE

a) How does the relentless force of weathering affect rock masses over time, and what critical challenges does this pose for engineers in the realm of building construction? (10mks)

b) Discuss the various key considerations and methods for assessing the effects of weathering and denudation on rock masses. (10mks)

QUESTION FOUR

a) Compare silicate and non-silicate minerals, providing examples of each. Discuss their accumulation and importance in geological history. (10mks)

b) Discuss the major types of faults and describe the conditions under which each type forms and their potential effects on construction projects. (10mks)

QUESTION FIVE

a) Joints are a significant factor in geological stability and engineering design. Discuss the nature and classification of joints, highlighting their types. How do joints impact slope stability and what design considerations should engineers take into account when constructing on or near jointed rock masses?

(10mks)

b) Tunnels are classified based on various factors such as purpose, construction material, alignment, supporting arrangements and shape. Explain two types of each classification, giving the advantages and disadvantages of each type. Support your answer with relevant examples.

(10mks)

QUESTION SIX

a) Analyze how human activities such as deforestation, mining, and urbanization accelerate denudation. Propose strategies for minimizing their impact on landscapes and preventing excessive soil erosion in affected areas. (10mks)

b) Clay minerals significantly affect soil behavior in engineering projects. How does the presence of clay influence soil drainage, stability, and performance? Discuss the implications of clay-rich soils on the design and execution of engineering projects. (10marks)

*****Good Luck *****