INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - AUGUST 2025

PROGRAMME: BSEM
YEAR/SEM: YEAR 1/SEMESTER 1
COURSE CODE: BSE1102
NAME: SOIL SCIENCE

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Section A: Attempt all questions in this section (40 marks)

Question 1:

a. A farmer notices that their maize crop is yellowing and stunted despite adequate rainfall and fertilization. A soil test reveals a pH of 4.8. What recommendations would you give the farmer to improve the soil conditions and promote healthy crop growth? (6 marks)
b. Define the term parent material in the context of pedogenesis and mention its various categories. (6 marks)
c. How do organisms, including plants and microorganisms, influence soil development? (5 marks)
d. What is cation exchange capacity (CEC), and why is it important in soil fertility management? (6marks)
e. Differentiate between soil contamination and soil pollution. Give examples. (5 marks)
f. Mention at least five kinds of soil organisms and their roles in such an ecosystem. (6 marks)
g. What are halophilic organisms? (3 marks)
h. Mycorrhizal fungi form symbiotic relationships with plant roots, why is this important? (3 marks)

Question 2:

a. What role does climate play in pedogenesis? (5 marks)
b. In what ways does relief (topography) affect the thickness and quality of soils? (5 marks)
c. A community gardening project receives a donation of lime and sulfur to improve their garden soil. They are unsure which to apply. A quick soil test shows their soil pH is 9.1. Which amendment should they use, and why? (5marks)
d. What is cation exchange capacity (CEC), and why is it important in soil fertility management? (5 marks)
e. Compare the CEC of sandy soils and clay soils. How does this difference affect their ability to retain nutrients? (6 marks)
f. What type of relationship exists between mycorrhizal fungi and plant roots? What is the importance of this relationship? (5 marks)
g. In which ways do soil contaminants differ from soil pollutants? Explain with examples. (5 marks)
h. Where do soil pollutants come from? (4 marks)

SECTION B

Section B; Answer any 3 questions. (20 marks each)

Question 1:

a. What are the major steps involved in the transformation of rock into soil? (10 marks
b. What are the major horizons in a typical soil profile, and how do they differ from one another? (10 marks)

Question 2:

Soil profile is defined as the vertical section of the soil that reveals its various layers, each of which has distinct physical, chemical, and biological characteristics.
a. Draw and label a fully mature soil profile diagram (6 marks)
b. Define the various layers, giving their distinct characteristics (14 marks)

Question 3:

a. What is soil pH, and why is it important in agriculture? (5 marks)
b. A mining company is required to restore degraded land after operations. Tests reveal that the exposed soil has a pH of 2.9. What challenges does this acidic pH present, and what steps can be taken to rehabilitate the soil for vegetation growth? (8 marks)
c. With examples, differentiate between micronutrients and macronutrients. (7 marks)

Question 4:

a. Define soil composition (2 marks)

b. With the help of a suitable diagram, show the components soil in their respective proportions under normal circumstances. (8 marks)

c. How can human activities such as mining, urbanization, or agriculture alter the natural composition of soil, and what are the long-term consequences for soil health and environmental quality? (10 marks)

Question 5:

a. What is soil biota? (2 marks)
b. A wetland is drained and converted into agricultural land. Within a year, farmers report increased plant diseases. How might the alteration of soil biological conditions have contributed to this problem, and what management interventions can mitigate them? (8 marks)
c. What soil management practices can promote diversity and activity of soil biota? (10 marks)

Question 6:

How do variations in the proportions of sand, silt, and clay in soil affect its water retention, nutrient availability, and aeration, and how can these properties influence land use decisions? (20 marks)

Question 7:

Two fields—one mulched and the other bare—are growing the same crop during a dry spell. The mulched field shows healthier plants. How does mulching affect soil moisture dynamics, and what mechanisms explain the observed difference? (20 marks)

Question 8:

Define the following terminologies as applied in soil science. (2 marks each)
i. Saturation
ii. Elluviation
iii. Infiltration
iv. Weathering
v. decomposition
vi. Illuviation
vii. Soil structure
viii. Soil permeability
ix. Field capacity
x. Permanent wilting point

Question 9:

a. How do leguminous crops relate with soil fertility? (8 marks)
b. Differentiate between soil fertility and soil productivity. (6 marks)
c. How does fertilizer use in agriculture affect aquatic ecosystems? (6 marks)

Question 10:

a. What is pedogenesis? (2 marks)
b. What are the primary factors that contribute to soil formation? Discuss how each factor contributes to soil formation (18 marks)

Question 11:

a. What do you understand by the term organic matter in soil science? (2 marks)
b. What role does organic matter play in soil ecosystems? (10 marks)
c. Certain factors affect the organic matter content of soils in various places. Discuss (8 marks)

Question 12:

a. Mention at least five types of organisms in the soil (5 marks)
b. Discuss the roles of living organisms in the soil (12 marks).
c. How do agricultural practices, such as mulching and cover cropping, impact soil biological activity? (3 marks)