INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

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

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Answer all questions in this section. (40 marks)

Question 1:

a. What is cation exchange capacity (CEC), and why is it important in soil fertility management? (5marks)
b. Define the term seed germination. In which horizon does seed germination commonly take place and why? (5 marks)
c. Differentiate between residual and transported parent materials (5 marks).
d. How does soil contamination differ from soil pollution? Give examples under each category. (5 marks)
e. What are the components of soil? (4 marks)
f. What is cation exchange capacity (CEC), and why is it important in soil fertility management? (5 marks)
g. How does the CEC of sandy soils differ from that of clay soils? And how does this property relate with the fertility of the mentioned soil types? (5 marks)
h. What type of relationship exists between mycorrhizal fungi and plant roots? What is the importance of this relationship? (4 marks)
i. What are the sources of soil pollutants? (2 marks)

Question 2:

a. How do organisms, including plants and microorganisms, influence soil development? (4 marks)
b. Differentiate between soil contamination and soil pollution. Give examples. (4 marks)
c. What is seed germination? (2 marks)
d. In which layer of the soil does seed germination take place and why? (4 marks)
e. Differentiate between alluvial and Aeolian parent materials (4 marks).
f. Define the term parent material in the context of pedogenesis and mention its various categories. (5 marks)
g. What role does climate play in pedogenesis? (4 marks)
h. In what ways does terrain affect the depth and quality of soils? (4 marks)
i. What is CEC in full? How does CEC affect soil fertility? (4marks)
j. What do you know about halophilic organisms? (2 marks)
k. How do Mycorrhizal fungi relate with plant roots, and why is this relationship important? (3 marks)

SECTION B

Answer any 3 questions in this section. (60 marks)

Question 1:

a. Define parent material and explain its role in determining the chemical properties of soils (10 marks)
b. With examples, describe the main categories of parent material in soil formation. (10 marks)

Question 2:

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 3:

a. What name is given to the inorganic components of soil derived from the weathering of rocks? (2 marks)
b. Discuss the distinct characteristics of the 3 main characteristics of these inorganic components. (18 marks)

Question 4:

a. Define soil profile (2 marks)
b. Draw and label a fully mature soil profile diagram (6 marks)
c. How do the horizons differ from one another? (12marks)

Question 5:

a. Define SOM and describe its main components and sources. (10 marks)
b. What role does SOM play in the soil? (10 marks)

Question 6:

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)

Question 7:

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 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. What name is given to the mechanism by which gas molecules constantly move between soil and the atmosphere? (2 marks)
b. The major components of soil air are similar to those of the atmospheric air, but their proportions differ due to biological and chemical activities within the soil. Discuss. (12 marks)
c. What role does soil aeration play in the normal functioning of the ecosystem? (6 marks)

Question 10:

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 11:

Explain the major ecological functions of soil and discuss how these functions contribute to ecosystem sustainability. (20 marks)

Question 12:

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)