KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2020/2021

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

BCM 207: SOIL MECHANICS AND FOUNDATIONS

DATE: TUESDAY 6TH APRIL 2021 **TIME: 2.00 P.M. - 4.00 P.M.**

INSTRUCTIONS:

ANSWER QUESTIOIN ONE AND ANY OTHER TWO QUESTIONS FROM SECTION TWO

SECTION 1: COMPULSORY (30 MARKS)

QUESTION 1

a) Define the term soil giving its four components. (2 marks)

b) Explain the role organisms play in the formation of soils. (3 marks)

c) Explain any TWO chemical methods by which rocks weather. (3 marks)

d) Discuss texture as a property of soil. (3 marks)

e) With the aid of soil phase diagrams, show that bulk density is expressed as

$$\rho = \frac{\rho_w (G_s + eS_r)}{1+e}$$

(4 marks)

f) Outline the index properties and the relevant classification tests for coarse grained soils. (3 marks)

g) State three purposes of a soil classification system. (1.5 marks)

h) Explain shear strength as an engineering property of soils. (1.5 marks)

i) Explain in detail why soil exploration is carried out. (3 marks)

j) Define soil investigation and outline the purposes of carrying out soil investigations. (3 marks)

k) Discuss the term mechanical stabilization of soils. (3 marks)

SECTION 2: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION 2 (20 MARKS)

a) Outline the TWO differences between compaction and consolidation. (2 marks)

b) Explain the THREE importance aspects of soil explorations. (4.5 marks)

c) With the aid of a sketch, explain the concept of shearing resistance and shearing strength applied to soils which are purely granular in character. (6.5 marks)

d) Discuss gravitational water in soils. (3 marks)

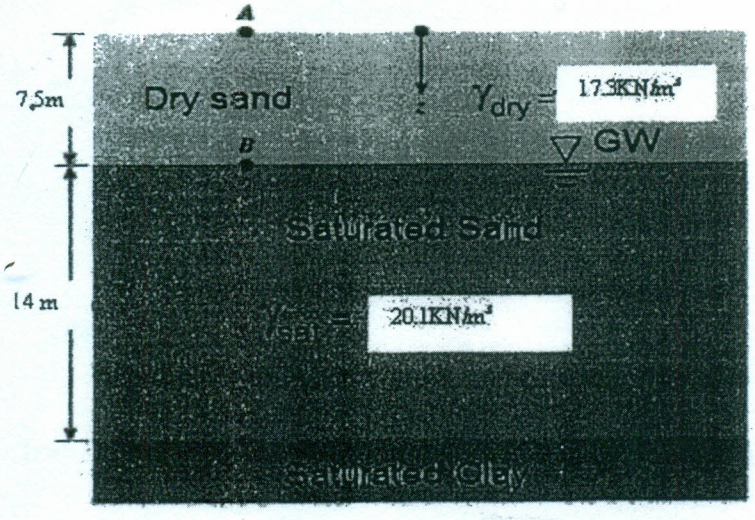
e) Discuss the mechanism of stabilization of soils by the following methods.

i. Soil stabilization by electrical and thermal methods. (2 marks)

ii. Soil aggregate stabilization. (2 marks)

QUESTION 3 (20 MARKS)

a) For the soil profile calculate the vertical total stresses , effective stresses and pore water pressure at points (A), (B), and (C). (5 marks)



b) Discuss any THREE consequences of settlements and any THREE cases of uneven settlements where settlement joints can be applied in buildings. (6 marks)

c) Define underpinning and give THREE structural reasons which would require underpinning methods for stabilization of the foundation. (4 marks)

d) Define the term foundation. (1 mark)

e) Briefly discuss any TWO factors which affect the choice and design of a foundation. (4 marks)

QUESTION 4 (20 MARKS)

a) Discuss in detail the THREE stages of consolidation until settlement is complete. (6 marks)

b) With the aid of sketches discuss the mass concrete underpinning method. (5 marks)

c) Discuss significance of

i. shear tests

ii. consolidation tests

(4 marks)

d) With the aid of a sketch outline a situation where a trapezoidal combined foundation is suitably used. (3 marks)

e) Outline the mechanism by which molasses stabilize soils. (2 marks)

QUESTION 5 (20 MARKS)

a) Discuss and sketch a typical form of wall strip footing. (4 marks)

b) Discuss TWO solutions to minimize the issues caused by use of strip footing in sloping building sites. (4 marks)

c) Outline two situations which justify the use of raft foundations. (1 mark)

d) With the aid of sketches discuss the classification of piles by their basic design functions. (3 marks)

e) Using clearly labeled sketches, explain the terms active earth pressure and passive earth pressure. (5 marks)

f) Outline any TWO functions of retaining walls. (1 mark)

g) With the aid of a well labeled sketch, show a cantilevered retaining wall and the various stresses on it. (2 marks)

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