2705/202 2707/202
2709/202 2710/202
STRUCTURES II, GEOTECHNOLOGY II
AND CONCRETE TECHNOLOGY II
Oct./Nov. 2016
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN BUILDING TECHNOLOGY
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE

MODULE II

STRUCTURES II, GEOTECHNOLOGY II AND CONCRETE TECHNOLOGY II

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Drawing instruments;
Scientific calculator.
*This paper consists of **EIGHT** questions in **THREE** sections, **A, B** and **C**.*
*Answer **FIVE** questions choosing **TWO** questions from section **A**, **TWO** questions from section **B** and **ONE** question from section **C**.*
All questions carry equal marks.
Maximum marks for each part of a question are as indicated.
Candidates should answer the questions in English.

This paper consists of 5 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

SECTION A: STRUCTURES II

*Answer **TWO** questions from this section*

1. A 400 mm square column carries a dead load of 1050 kN and imposed load of 300 kN. The safe bearing capacity of the soil is 170 kN/m². Design and detail a square pad footing to resist the loads assuming the following material strengths:

   f_{cu} = 35 N/mm² and f_y = 460 N/mm².

   Assume any other relevant information. (20 marks)

2. **Figure 1** shows a cantilever retaining wall back filled with granular material having a unit weight of 19 kN/m³ and an internal angle of friction Ø of 30°. Assuming that the allowable bearing pressure of the soil is 120 kN/m², the coefficient of friction is 0.4 and the unit weight of reinforced concrete is 24 kN/m³, determine:

   (i) factor of safety against sliding; (9 marks)
   (ii) factor of safety against overturning. (5 marks)
   (iii) the ground bearing pressures. (6 marks)

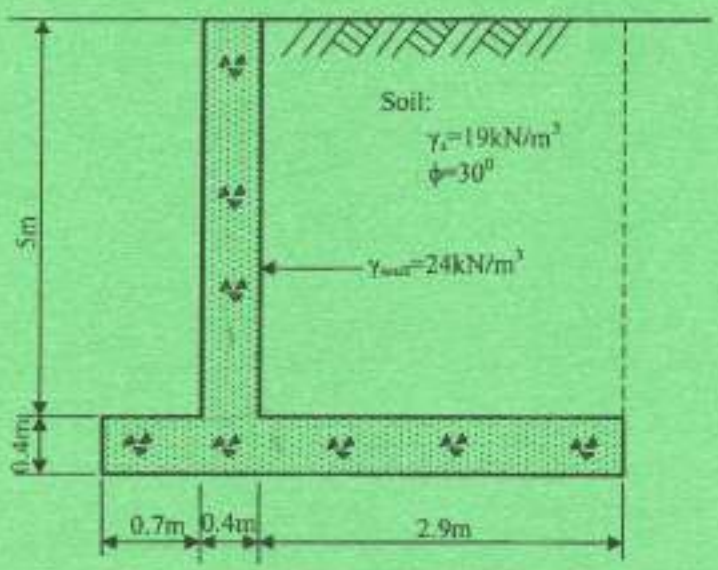

Fig. 1

3. (a) List **three** modes in which bending moments may be induced in a structural member. (3 marks)

(b) A beam AB is simply supported at the ends and has a constant flexural rigidity (EI) and is loaded as shown in **figure 2**. Using Macaulay's method, determine the value of the maximum deflection in terms of EI. (17 marks)

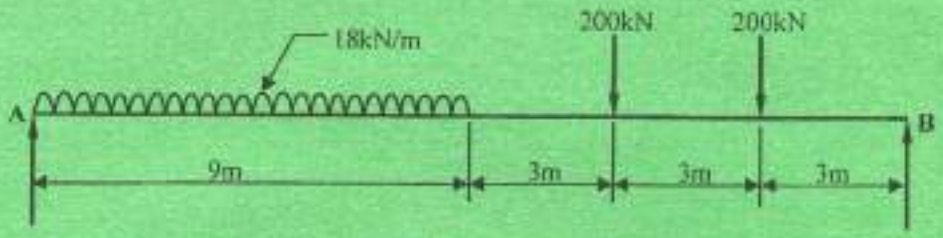

Fig. 2

SECTION B: GEOTECHNOLOGY II

*Answer **TWO** questions from this section*

4. (a) With the aid of sketches, describe the following types of geological faults:

(i) normal fault;
(ii) reverse fault. (5 marks)

(b) (i) Differentiate an outlier from an inlier.
(ii) With the aid of sketches, describe the following features in a volcanic eruption.

(I) sill;
(II) dyke. (7 marks)

(c) Explain physical weathering and list **three** ways in which it occurs. (4 marks)

(d) Describe the term 'geological maps'. (4 marks)

5. (a) Explain each of the following geological terms:

(i) alkali rock;
(ii) acid rock;
(iii) agglomerates;
(iv) conglomerates. (6 marks)

(b) (i) State **three** factors to be considered before tunnelling operations commence.
(ii) With the aid of sketches, describe the following methods of tunnelling:

(I) head and benching method;
(II) full face method;
(III) drift method. (12 marks)

(c) With reference to the earth's structure, describe the mantle. (2 marks)

6. (a) Explain each of the following quarrying terms:

(i) blasting;
(ii) over-burden;
(iii) screening. (3 marks)

(b) (i) With aid of sketches, describe **two** types of dams.
(ii) List **four** factors which influences the location of a dam. (8 marks)

(c) List and describe **six** physical properties used for identifying minerals in rocks. (9 marks)

SECTION C: CONCRETE TECHNOLOGY II

*Answer **ONE** question from this section*

7. (a) With aid of illustration, describe the following:

(i) construction joint;
(ii) contraction joint;
(iii) expansion joint. (9 marks)

(b) Outline **four** considerations in the choice of precast concrete units as construction elements. (8 marks)

(c) Explain the following with respect to mixing of concrete:

(i) mixing cycle;
(ii) output of mixers. (3 marks)

8. (a) Describe the following types of concrete vibrators:

(i) internal vibrators;
(ii) form vibrators. (5 marks)

(b) Explain the effects of hot weather condition on fresh concrete. (5 marks)

(c) Describe **four** methods used for placing concrete under water. (6 marks)

(d) Distinguish between reinforced and prestressed concrete. (4 marks)

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