2705/202
2707/202
2709/202
2710/202
STRUCTURES II, GEOTECHNOLOGY II
AND CONCRETE TECHNOLOGY II
Oct./Nov. 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN BUILDING CONSTRUCTION
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:
Drawing instruments;
Scientific calculator
*This paper consists of **EIGHT** questions in **THREE** sections; **A, B** and **C**.*
*Answer **FIVE** questions choosing **THREE** questions from section **A, ONE** question from section **B** and **ONE** question from section **C** in the answer booklet provided.*
Maximum marks for each part of a question are as indicated.
Candidates should answer the questions in English.

This paper consists of 4 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

*Answer **THREE** questions from this section.*

1. (a) Describe each of the following in the design of engineering structures:

   (i) ultimate limit state;
   (ii) servicability limit state.

   (4 marks)

   (b) Using BS 8110 design the longitudinal steel and links for a square column of dimension 250 x 250 mm thick. The column is short and braced and is to carry on axial load of 1350 kN with the following material properties:

   $f_{cu} = 30\ N/mm^2$
   $f_y = 460\ N/mm^2$

   (16 marks)

2. (a) State the Mohr's first and second theorems. (2 marks)

   (b) Using Mohr's method, derive the expression for the maximum slope and deflection for a simply supported beam of span L. carrying a uniformly distributed load of w/unit length over the entire span. (8 marks)

   (c) A simply supported beam of span 6 m carries a point load of 450 kN at the midspan. Using Mohr's theorem calculate:

   (i) the maximum slope;
   (ii) the maximum deflection;
   (iii) the deflection of the beam at 1.4m from either end.

   Take: $E = 205\ kN/mm^2$
   $I = 2.1 \times 10^9\ mm^4$

   (10 marks)

3. (a) A reinforced concrete floor is subjected to an imposed load of 4 kN/m and spans between break walls as shown in **figure 1**
   Design the floor with a concrete cover of 25 mm. $F_{cu} = 35\ N/mm^2$ and $f_y = 460\ N/mm^2$

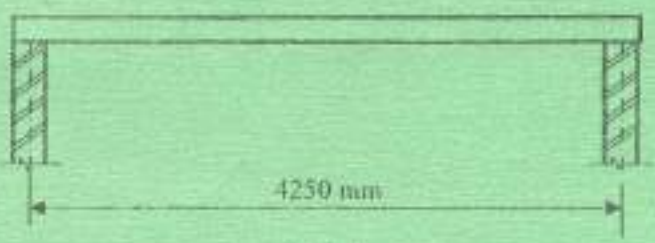

Fig. 1

(16 marks)

   (b) Detail the slab design in question 3(a) above. (4 marks)

4. (a) Determine the resultant if tension occurs at the base when a lateral thrust of uniform wind pressure guts on the wall shown in **figure 2**.
Take density of wall as 2000 kg/m³.

Fig. 2

(14 marks)

(b) With aid of sketch clearly elaborate **three** critical modes of failure of a retaining wall.
(6 marks)

SECTION B: GEOTECHNOLOGY

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

5. (a) (i) Define the term weathering. (1 mark)

(ii) Describe **three** processes of physical weathering. (4 ½ marks)

(b) (i) State **three** purposes of tunneling. (3 marks)

(ii) Briefly describe **three** geological defects that may be encountered during tunnel construction. (4 ½ marks)

(c) (i) With aid of sketches describe **two** types of faults. (5 marks)

(ii) Outline **two** physiographical evidences used in recognizing faults in the fields.
(2 marks)

6. (a) State **six** geological factors considered for selection of a dam site. (6 marks)

(b) (i) Briefly explain **three** methods used in prospecting for suitable quarries.
(4 ½ marks)

(ii) Outline the excavation method used in hardrock quarries. (1 ½ marks)

(c) With reference to **figure 3** draw a geological cross-section of A-B. (8 marks)

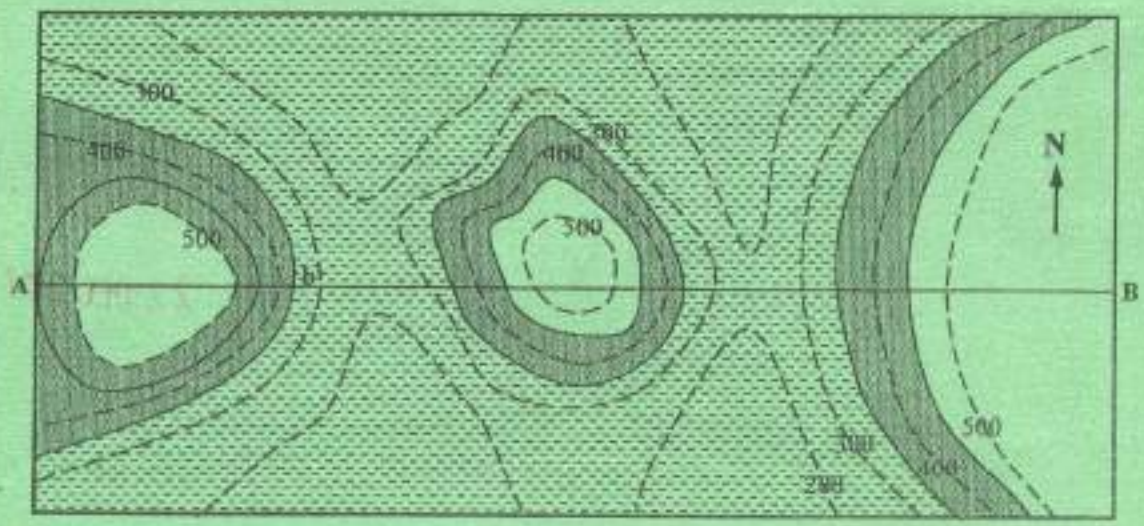

Fig. 3

SECTION C: CONCRETE TECHNOLOGY II

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

7. (a) Briefly describe the treme pipe method of concreting underwater. (8 marks)

(b) (i) State **six** routine maintenance measures of a concrete batching and mixing plant. (6 marks)

(ii) State **three** advantages of tilting drum mixes. (3 marks)

(c) Briefly explain **three** safety gears that should be worn on a concreting site. (3 marks)

8. (a) Briefly describe **two** methods of pre-stressing concrete. (4 marks)

(b) Outline **four** factors that may lead to failure of prestressed concrete. (8 marks)

(c) (i) State **two** factors that determine the need of joints in concrete pavement. (2 marks)

(ii) Briefly describe **three** types of concrete pavements. (6 marks)

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