2705/202 2709/202
2707/202 2710/202
STRUCTURES II, GEOTECHNOLOGY II
AND CONCRETE TECHNOLOGY II
June/July 2017
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 indicated.*
***Candidates should answer the questions in English.***

**This paper consists of 6 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 in this section.*

1. (a) **Figure 1** is a simply supported beam carrying a point load as shown:

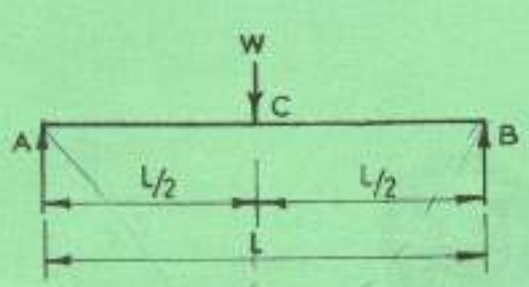



**Figure 1**

From Mohr's principles, prove that:

(i) maximum slope of the beam = $\theta_{max} = \frac{-WL^2}{16EI}$;

(ii) maximum deflection of the beam, $y_{max} = \frac{-WL^3}{48EI}$.

Where E = modulus of elasticity;
I = moment of inertia. (16 marks)

(b) A simply supported beam of span 3 m is subjected to a central point load of 10 kN. By using Q 1 (a) above, determine:

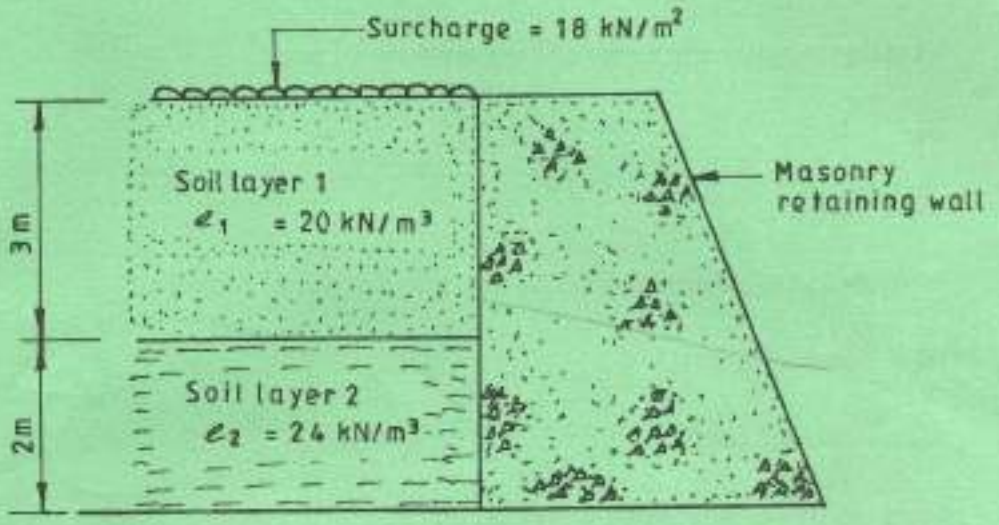
(i) the maximum slope of the beam;

(ii) the maximum deflection of the beam.

Take I = 12 x $10^6$ mm$^4$
E = 200 x $10^3$ N/mm$^2$. (4 marks)

2. (a) Differentiate between active earth pressure and passive earth pressure. (4 marks)

(b) **Figure 2** shows a masonry retaining wall supporting two layers of soils.




NOTE :
- Angle of repose for both soils = 30°

**Figure 2**

Determine:

(i) the resultant lateral force on the wall;
(ii) the distance of the point of application from the bottom of the wall.

(16 marks)

3. A 150 mm thick reinforced concrete slab simply supported on 200 mm thick walls has effective spans of 6.6 m x 3.0 m. Use the data provided below to design for bending only and hence sketch the slab showing reinforcement details.

Data

| | | |
|---|---|---|
| Imposed load | - | 2.6 kN/m²; |
| Finishes | - | 0.4 kN/m²; |
| Concrete density | - | 24 kN/m³; |

Take:
Cover as 15 mm thick
Concrete grade C30
fy = 460 N/mm².

(20 marks)

## SECTION B: GEOTECHNOLOGY II

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

4. (a) Explain the following terms of the elements of faults:

   (i) fault;

   (ii) dip. (5 marks)

   (b) With the aid of sketches, describe the following types of faults:

   (i) normal faults;

   (ii) reverse faults. (12 marks)

   (c) State the **three** recognition of faults. (3 marks)

5. (a) Explain **three** factors that influence the method of breaking a hard rock. (6 marks)

   (b) Describe the drilling and blasting method of breaking a hard rock. (8 marks)

   (c) Explain:

   (i) handling misfire of explosives;

   (ii) storing explosives. (6 marks)

6. (a) Distinguish between inlier and outlier. (4 marks)

   (b) Discuss the term time-scale as used in geology. (4 marks)

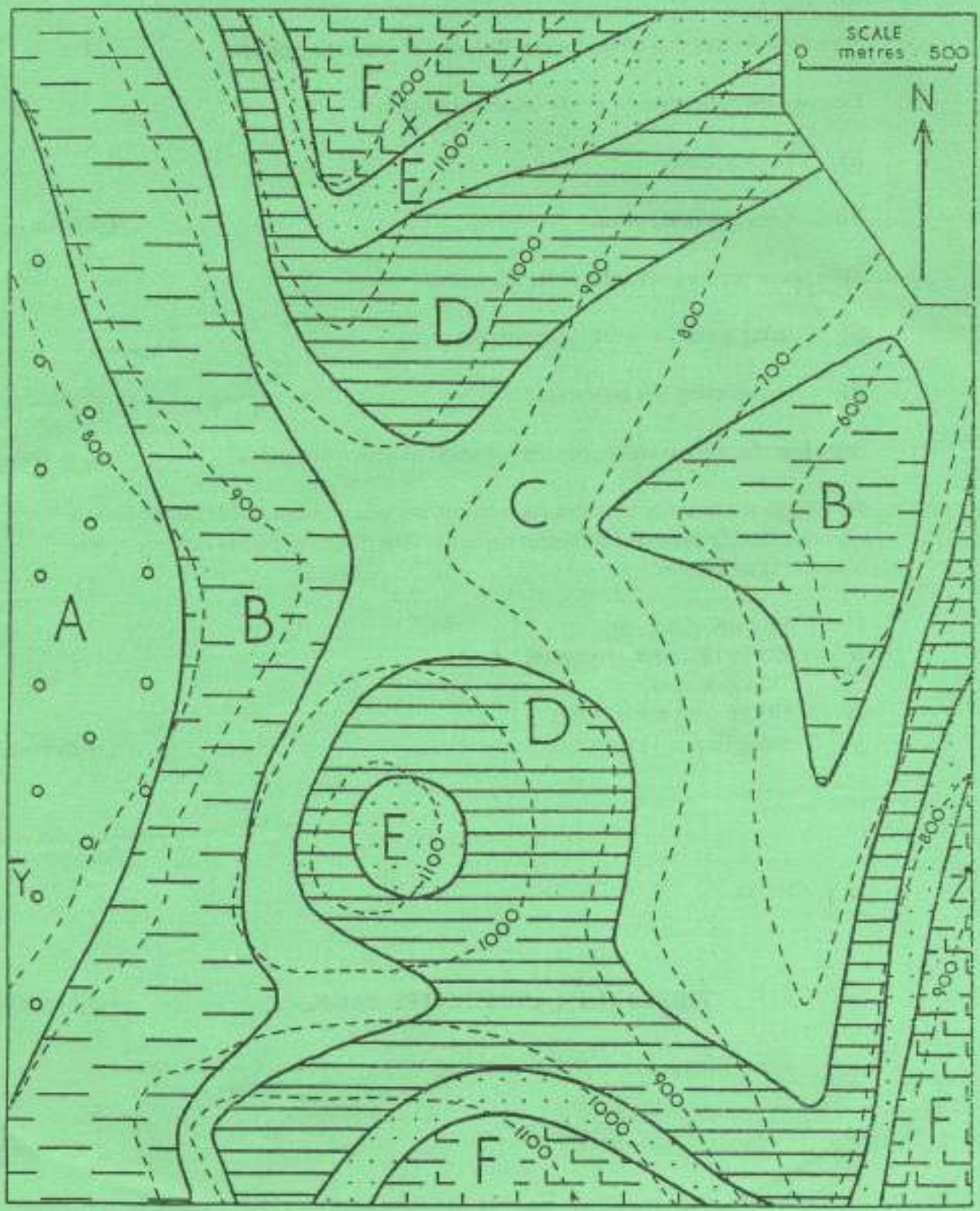
   (c) **Map 3** shows the plan of a geological map.

   (i) determine the gradient of the beds;

   (ii) draw a geological section along Y-Z to show the layers A, B, C, D and E;

   (iii) on the geological section, indicate an inlier and outlier. (12 marks)

## MAP 3



## SECTION C: CONCRETE TECHNOLOGY II

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

7. (a) State **four** factors that affect the productivity of concreting plants. (4 marks)

(b) Describe the following types of concreting plants:

(i) trucker mixer;

(ii) central mixing plant. (10 marks)

(c) State **three** precautions to be observed when:

(i) using a hoist as a lifting appliance;

(ii) transporting wet concrete. (6 marks)

8. (a) State **four** factors that influence the selection of concreting plant. (4 marks)

(b) Determine the quantity of materials required per batch and probable output from a concrete mixing plant of 1200 litres capacity. The design per 1000 litres of mixed concrete is as follows:

I 5.6 bags of cement;
II 923 kg of coarse aggregates;
III 715 kg of sand;
IV 195 litres of water;
V fixing time = 115 seconds. (16 marks)

**THIS IS THE LAST PRINTED PAGE.**