

2307/306  
CIVIL ENGINEERING CONSTRUCTION  
AND DRAWING  
Oct./Nov. 2009  
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL  
DIPLOMA IN CIVIL ENGINEERING  
CIVIL ENGINEERING CONSTRUCTION AND DRAWING  
3 hours

**INSTRUCTIONS TO CANDIDATES**

*You should have the following for this examination:*

*Answer booklet  
Drawing instruments  
Drawing Paper size A<sub>1</sub>*

*This paper consists of **EIGHT** questions in **TWO** sections; **A** and **B**.  
Answer **FOUR** questions in section **A** and **ONE** question from section **B**.  
Questions in Section **A** carry 15 marks each while those in section **B** carry 40 marks each.  
Maximum marks for each part of a question are as shown.*

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.

## SECTION A: CIVIL ENGINEERING CONSTRUCTION

Answer any **FOUR** questions from this section.

1. (a) (i) State **four** objectives of water treatment.  
(ii) State **four** factors to be considered while laying water treatment works. (4 marks)
- (b) Describe the following processes of water treatment:  
(i) Screening;  
(ii) Sedimentation with coagulation. (5 marks)
- (c) With the aid of sketches, describe **two** water distribution systems. (6 marks)
2. (a) With the aid of a labelled sketch, explain the difference between shallow and deep wells. (5 marks)
- (b) State **three** advantages of tube wells and **three** factors that affect the yield of a well. (3 marks)
- (c) State **three** factors considered in the selection of a site for water intake works. (3 marks)
- (d) With the aid of a labelled sketch, describe "breakwaters". (4 marks)
3. (a) With the aid of sketches, describe the following methods of tunneling in rocks:  
(i) heading and benching method;  
(ii) pilot tunnel method. (7 marks)
- (b) Distinguish between 'dredging' and 'reclamation' and state **two** reasons for each. (4 marks)
- (c) Sketch and label each of the following:  
(i) crib cofferdam;  
(ii) double skin cofferdam. (4 marks)
4. (a) Sketch and label each of the following rail fastenings and outline the function of each:  
(i) rail chairs;  
(ii) bearing plates. (5 marks)

- (b) With the aid of sketches briefly describe the following in railways:
- (i) compound curve;
  - (ii) reverse curve. (4 marks)
- (c) Explain where each of the following types of foundations is used:
- (i) raft foundations;
  - (ii) wide strip foundations;
  - (iii) pile foundations. (6 marks)
5. (a) (i) Define the following terms in sewerage:
- dry weather flow;
  - biochemical oxygen demand.
- (ii) Briefly describe the three sewerage systems. (6½ marks)
- (b) Describe an oxidation pond. (4½ marks)
- (c) (i) Define a spillway.
- (ii) Sketch and label the following types of spillways:
- Siphon spillway;
  - Ogee spillway. (4 marks)
6. (a) With the aid of a labelled sketch, describe a flexible pavement. (5½ marks)
- (b) With the aid of a labelled sketch, explain the importance of drainage in a road partly in an embankment and a cutting. (4½ marks)
- (c) Briefly explain the term "California Bearing Ratio". (2 marks)
- (d) With the aid of a sketch, briefly describe a non-submersible bridge. (3 marks)

## SECTION B: DRAWING

Answer ONE question from this section.

7. (a) A rectangular combined pad footing is 4750 mm long, 2250 mm wide 500 mm thick. The pad supports two 300 x 300 mm reinforced concrete columns symmetrically located at 500mm from the edge of side. Using the information provided, draw to a scale of 1:25:

- (i) the plan  
(ii) the section.

Information:

- Bottom main bars Y20 @ 200mm c/c
- Bottom distribution bars Y12 @ 300 mm c/c
- Top main bars Y20 @ 150 mm c/c
- Top distribution bars Y12 @ 300mm c/c
- Starter bars in columns 4 No Y20 in each with R6 @ 200 mm c/c links.
- Distance from top of base to underside of ground floors slab = 700 mm
- Thickness of ground floor slab = 150 mm
- Cover to reinforcement = 50 mm
- Blinding = 50 mm

(26 marks)

- (b) To a scale of 1:50, draw a section through a box caisson given the following data:

- Thickness of r.c. caisson walls 200 mm
- Internal width of caisson 5000 mm
- Thickness of r.c. caisson base slab 300 mm
- Height of caisson above base slab 4700 mm
- Water level: 1m below top of caisson wall
- Bed level: 3200mm below water level
- Rock blanket on bed level.

(14 marks)

8. To a scale of 1:50, draw and label the plan and section through a septic tank with double compartments A and B given the following data:

- compartment A : Size 4000mm x 2000 mm
- compartment B : size 2000mm x 2000 mm
- Liquid depth 1500mm in compartment B while depth in compartment A varies from 1500mm at the junction of the two compartments with a bed slope of 1:4 towards the inlet.
- Freeboard : 450mm
- Inlet chamber : 700 x 500mm internal dimensions
- Outlet chamber : 2000 x 500mm internal dimensions
- Stone walls : 200mm thick
- Assume any other relevant information.

(40 marks)