2705/103 2709/103
2707/103 2710/103
STRUCTURES I AND
CONSTRUCTION MATERIALS
Oct./Nov. 2016
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN BUILDING TECHNOLOGY
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE
MODULE I

STRUCTURES I AND CONSTRUCTION MATERIALS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet; and
Scientific calculator.
*This paper consists of **EIGHT** questions in **TWO** sections; **A** and **B**.*
*Answer **FIVE** questions; choosing **TWO** questions from section **A**, and **TWO** questions from section **B** and **ONE** question from either section **A** or **B**.*
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 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 o

SECTION A: STRUCTURES I

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

1. (a) (i) State Hooke's Law and write the Mathematical relationship between stress, strain and elastic modulus. (4 marks)

(ii) Sketch and label a typical stress-strain curve for a mild steel rod tested to destruction under tensile load. (6 marks)

(b) A mild steel specimen was tested to destruction under tension and the following results were obtained:

Length of specimen	= 380 mm
Bar diameter	= 30 mm
Load at yield point	= 249 kN
Extension under load of 60 kN	= 0.15 mm
Maximum load	= 375 kN
Length of specimen after fracture	= 446 mm
Diameter of cross section at fracture	= 22.4 mm

Determine the following:

(i) Young's modulus of elasticity for the specimen;
(ii) Yield point stress;
(iii) Working stress if the factor of safety applied on the yield stress is 1.5;
(iv) The percentage reduction in area.

(10 marks)

2. (a) Define the term perfect frame. (2 marks)

(b) A simply supported framework is loaded as shown in **figure 1**.

(i) Determine the reactions;

(ii) Using the method of joint resolution, determine the magnitude and nature of force in each member.

(18 marks)

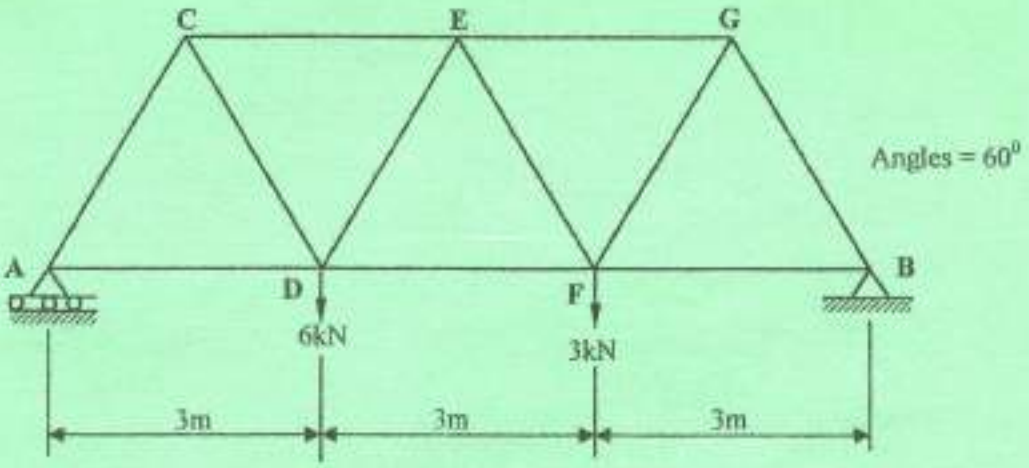


Fig. 1

3. (a) Define the following terms:

(i) shear force;
(ii) bending moment.

(4 marks)

(b) **Figure 2** shows a loaded beam.

(i) Plot the shear force and bending moment diagrams indicating values at critical points.

(ii) Determine the position and magnitude of the maximum bending moment.

(16 marks)

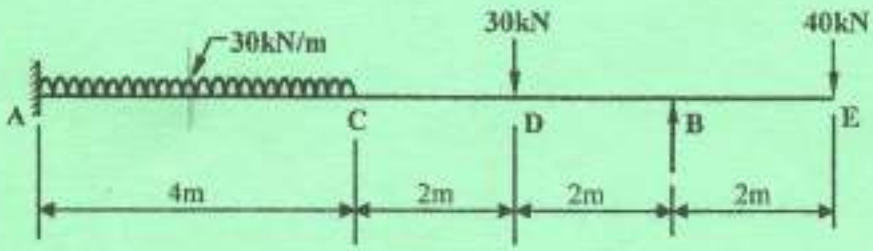
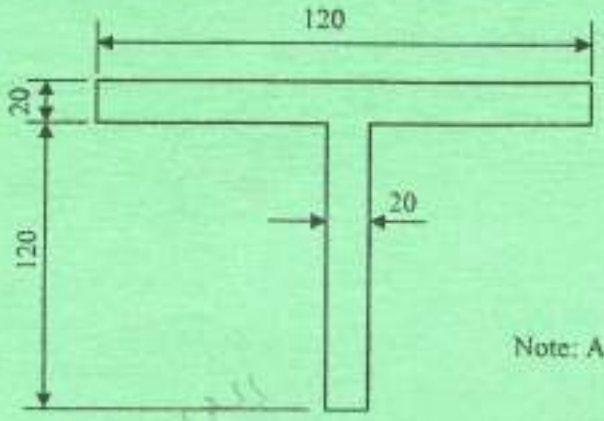


Fig. 2

4. (a) State **four** assumptions considered in the theory of simple bending. (4 marks)

(b) The T-Section shown in **figure 3** is subjected to a shear force of 80 kN at a section. Find the maximum shear stress in the section and show the variation of the shear stress. (16 marks)



Note: All dimensions in mm

Fig. 3

SECTION B: CONSTRUCTION MATERIALS

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

5. (a) Describe the procedure followed during hand mixing of concrete. (5 marks)

(b) With the aid of labelled sketches, describe the steps followed during the slump test of concrete. (7 marks)

(c) Explain **four** qualities of a good concrete. (8 marks)

6. (a) List **five** differences between stones and clay bricks when used as building materials. (5 marks)

(b) Explain the formation of the following rock classifications giving **one** example in each case:

(i) igneous rocks;
(ii) sedimentary rocks;
(iii) metamorphic rocks.

(9 marks)

(c) Describe **three** methods of quarrying stones. (6 marks)

7. (a) State **five** objectives of seasoning timber. (5 marks)

(b) With the aid of sketches explain any **three** methods of timber conversion. (9 marks)

(c) With the aid of sketches describe the following timber products:

(i) plywood;
(ii) blockboard.

(6 marks)

8. (a) (i) State **two** functions of cover to reinforcement.

(ii) State **four** design requirements of a good formwork.

(6 marks)

(b) (i) Differentiate between fine aggregates and course aggregates giving **one** example in each case.

(ii) Explain **two** classes of glass giving **one** use in each class.

(8 marks)

(c) State **six** characteristics of a good paint. (6 marks)

- SHOULD NOT FADE
- SHOULD HAVE GOOD AND APPEALING APPEARANCE
- SHOULD BE SMOOTH
- SHOULD BE LO

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6b) i) GNEISS - Igneous.

ii) SLATE - Sedimentary

iii) PUMICE - Metamorphic

6c) DIGGING.
BLASTING
HAMMERING.