

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.

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	L
Bar diameter	=	30 mm	
Load at yield point	=	249 kN	
Extension under load of 60 kN	=	0.15 mm	ΔL
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.
- (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)

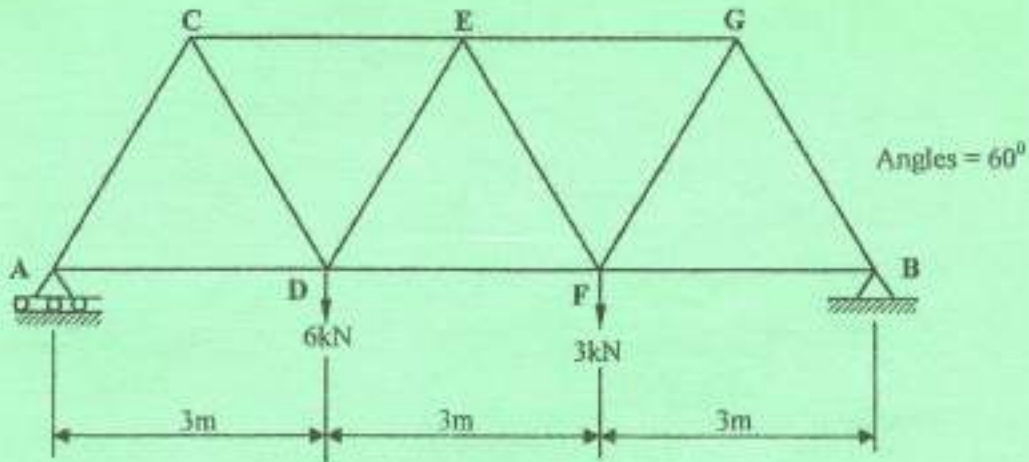


Fig. 1



3. (a) Define the following terms:

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

Moment
 Reaction at A = $(30 \times 4 \times 2) + (20 \times 2) + (40 \times 10)$
 $30 \times 8 + 40 + 400$
 $240 + 40 + 400$
 680 (4 marks)

Reaction at B = $(40 \times 2) + (20 \times 2) + (30 \times 4 \times 2) + (40 \times 10)$
 $80 + 40 + 240 + 400$
 760

- (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)

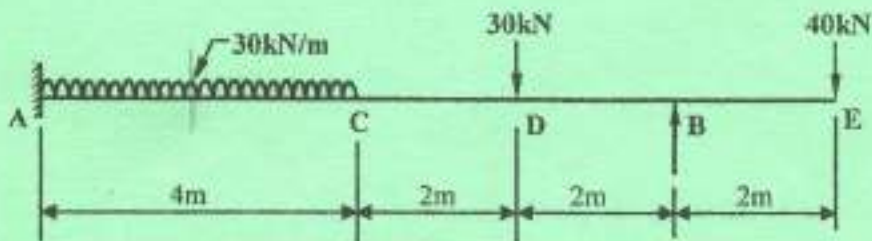
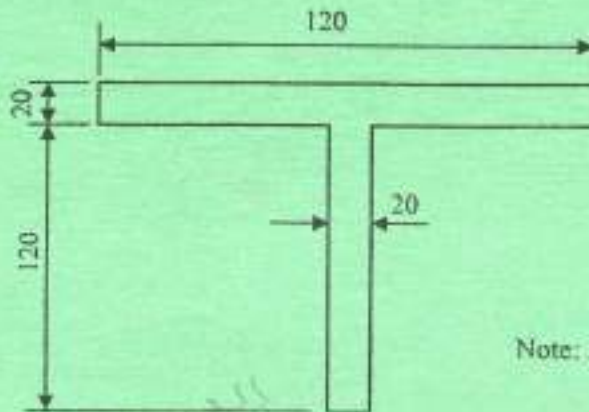


Fig. 2

$30 \times 4 \times 2 + 30 \times 2 + 40 \times 2$
 $240 + 60 + 80$
 380

4. (a) State **four** assumptions considered in the theory of simple bending.
 (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; *Gneiss*
 (ii) sedimentary rocks; *slate*
 (iii) metamorphic rocks; *quartzite* (9 marks)
 (c) Describe **three** methods of quarrying stones. *Blasting, Digging, Hammering* (6 marks)

Stop giving ppl the impression that JS - mtl & structure

7.

- (a) State five objectives of seasoning timber.
- (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. (6 marks)
- (ii) State four design requirements of a good formwork.
- (b) (i) Differentiate between fine aggregates and course aggregates giving one example in each case. (8 marks)
- (ii) Explain two classes of glass giving one use in each class. (6 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
 - should be long lasting

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~~6c) DIGGING~~

6c) DIGGING.
 BLASTING
 HAMMERING.

6b) I) GNEISS - Igneous.
 - Sedimentary
 II) SLATE
 - Metamorphic
 III) PUMICE.

HT