

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

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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.

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Turn over



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)

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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)

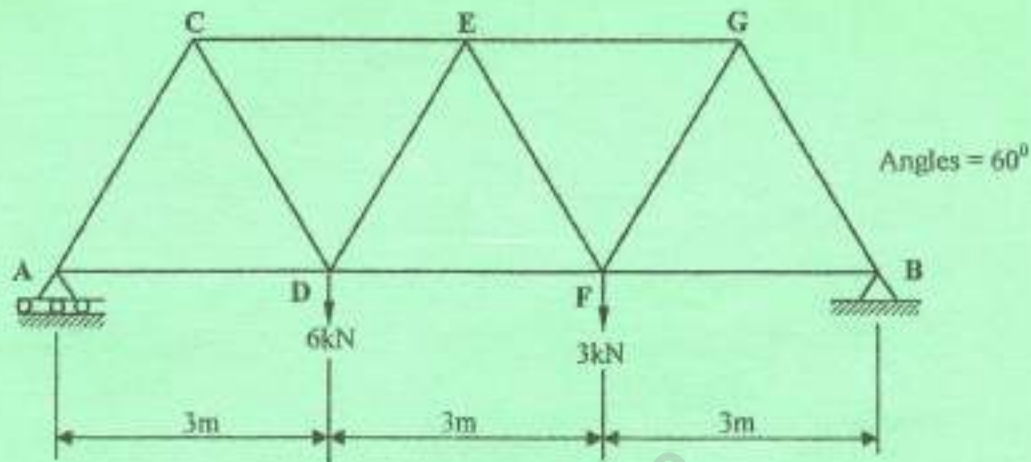


Fig. 1

3. (a) Define the following terms:

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

- (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)

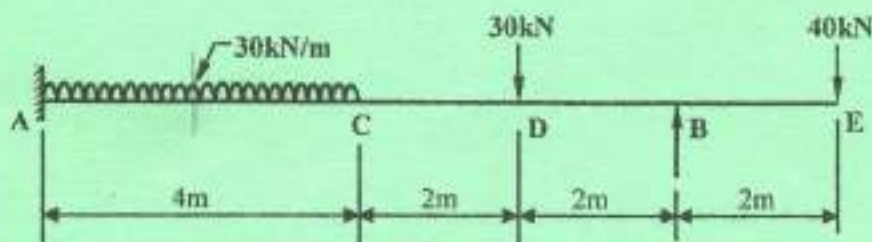
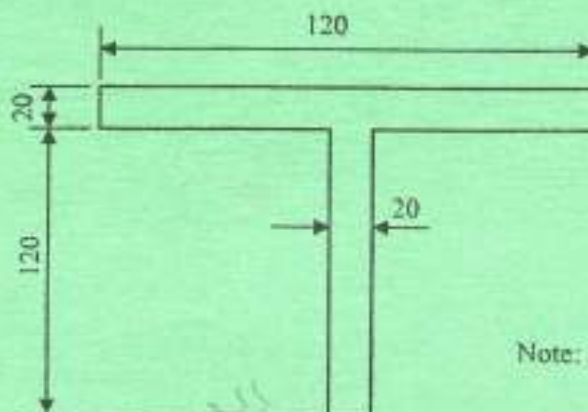


Fig. 2

4. (a) State **four** assumptions considered in the theory of
- (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; *marble*
- (9 marks)
- (c) Describe **three** methods of quarrying stones. (6 marks)



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.(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)

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

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

6c) DIGGING.
BLASTING
HAMMERING.