

Name: _____

SC 106

Index No: _____

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2705/103, 2709/103

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STRUCTURES I AND CONSTRUCTION

MATERIALS

Oct./Nov. 2013

Time: 3 hours



Date: _____



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

Write your name and index number in the spaces provided above.

Sign and write the date of the examination in the spaces provided above.

You should have drawing instruments and pocket calculator for this examination.

This paper consist of TWO Sections; A and B.

Answer TWO questions from section A, TWO questions from section B and ONE question from either section in the spaces provided.

All questions carry equal marks.

Maximum marks for each part of a question are as shown.

Do NOT remove any pages from this booklet.

Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A		20	
		20	
		20	
B		20	
		20	
		20	
Total Score			

This paper consists of 16 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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SECTION A: STRUCTURES I

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

1. (a) A hollow cylindrical steel tube with an outer diameter of 200 mm is to carry a vertical load of 2000 KN. If the axial stress in the steel is not to exceed 100 N/mm^2 , calculate the minimum thickness of the wall of the tube. (5 marks)
- (b) Figure 1, shows a symmetrical frame:
- (i) Determine the reactions;
- (ii) Using the method of joint resolution, determine the magnitude and nature of force in each member of the frame.

(15 marks)

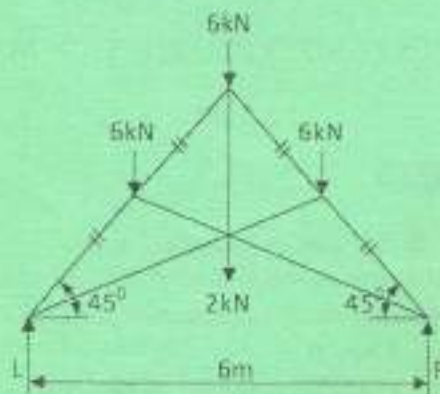


Figure 1

2. (a) A tension member 4 m long is made of timber and steel firmly fixed together side by side. The cross sectional area of the steel is 1300 mm^2 and that of timber is 4000 mm^2 . If the maximum permissible stresses for the steel and timber used separately are 140 N/mm^2 and 8 N/mm^2 respectively. Calculate:
- (i) The safe load that the member can carry;
- (ii) The elongation due to the load given that $E_{\text{steel}} = 205 \text{ kN/mm}^2$ and $E_{\text{timber}} = 8.2 \text{ kN/mm}^2$. (8 marks)
- (b) A simply supported beam is loaded as shown in figure 2:
- (i) Determine the reactions;
- (ii) Sketch the shear force diagram indicating critical values;
- (iii) Sketch the bending moment diagram indicating critical values.

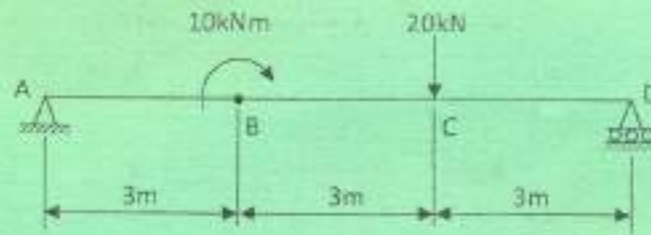


Figure 2

3. Figure 3, shows a section of a purlin:

- (i) Determine the position of the centroid;
- (ii) Calculate the second moments of area about both principal axes.
- (iii) Calculate the radius of gyration about both principal axes.
- (iv) Calculate the section modulus at point A.

(20 marks)

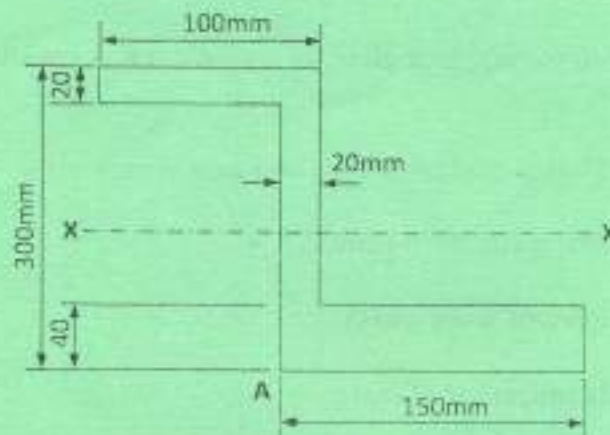


Figure 3

- 4. (a) A hollow alloy tube 3m long with external and internal diameters of 50mm and 40mm respectively was found to extend 4mm under a tensile load of 20kN. Determine Euler's buckling load for the tube when used as a column with both ends pinned. (8 marks)
- (b) A horizontal cantilever beam 3m long has a cross section as shown in figure 4. If the beam carries a uniformly distributed load of 10 kN/m along its entire length, calculate:
 - (i) The maximum tensile stress.
 - (ii) The maximum compressive stress.

(12 marks)

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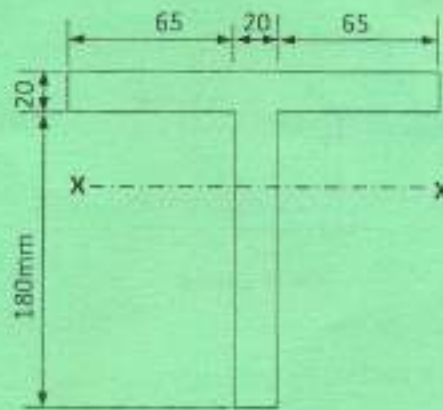


Figure 4

SECTION B: CONSTRUCTION MATERIALS

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

5. (a) List **six** constituents of glass. (3 marks)
- (b) Describe **four** forms in which glass for construction is available in the market. (8 marks)
- (c) Outline **three** classes of glass, giving **two** uses in each class. (9 marks)
6. (a) State **six** desirable qualities of paint. (3 marks)
- (b) Describe **two** types of resin varnish. (5 marks)
- (c) (i) State **six** properties of cast iron.
- (ii) Explain **three** classifications of steel and state **two** uses of the steel in each class. (12 marks)
7. (a) Outline **four** functional requirements of building stones. (6 marks)
- (b) Explain **three** classes of timber preservatives. (6 marks)
- (c) With the aid of sketches, explain **four** methods of converting timber. (8 marks)
8. (a) (i) List **four** uses of rubber in the construction industry. (2 marks)
- (ii) Explain **two** classification of rubber, giving one example of each. (6 marks)
- (b) Outline the characteristics of fat lime during slating. (4 marks)
- (c) Explain **four** uses of bitumen in the construction industry. (8 marks)

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