S T94

Name:_____ Index No:_____/_____

Candidate's Signature: _____

2705/103, 2709/103
2707/103, 2710/103
STRUCTURES I AND CONSTRUCTION MATERIALS
Oct./Nov. 2015
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 question paper.*
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.

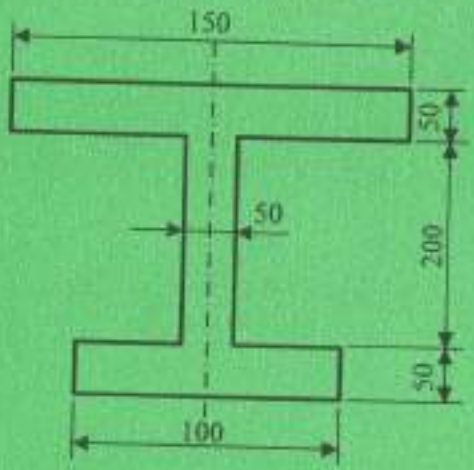
Turn over

SECTION A: STRUCTURES I

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

1. (a) Calculate the moment of resistance of the beam section shown in figure 1 if the stresses in the upper and lower flanges are limited to 25 N/mm² and 40 N/mm² respectively.

(12 marks)



Dimensions in mm

Fig. 1

(b) (i) A column 200 x 100 x 5 m long is fixed at both ends. Determine the Eulers buckling load on the column.
take E = 210 KN/mm²

(6 marks)

(ii) List any **two** assumptions made in Euler's analysis.

(2 marks)

2. Determine the forces in the members of the frame shown in figure 2, using the method of the joint resolution.

(20 marks)

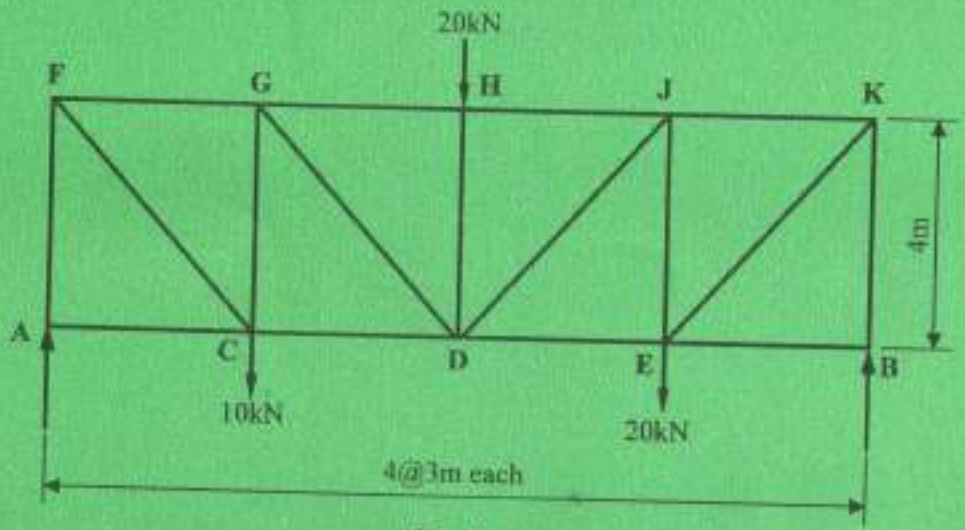


Fig. 2

3. (a) The diagram in figure 3 shows a bimetallic tube of 200 mm length. The tube carries a point load of 10 KN.

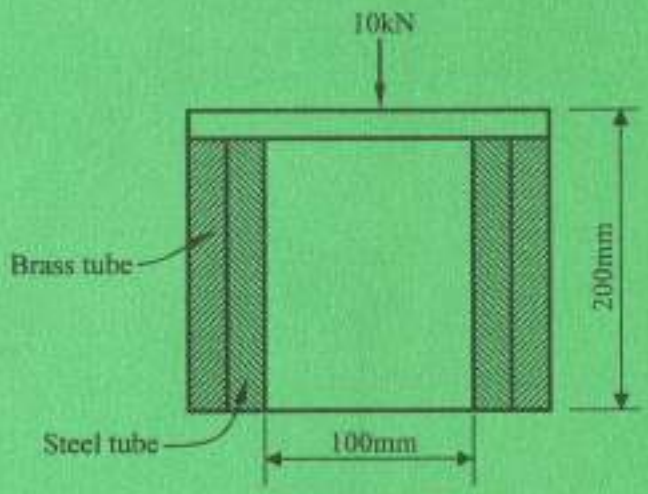


Fig. 3

Calculate:

(i) The load carried by each tube;

(ii) Change in the length of the tube.

Take:- $E_s = 2.1 \times 10^5$ N/mm²
$E_b = 1.0 \times 10^5$ N/mm²

(16 marks)

(b) Define the following terms:

(i) Bulk modulus;

(ii) Working stress;

(iii) Poison ratio;

(iv) Elasticity.

(4 marks)

4. Figure 4 shows a simply supported beam with overhanging ends loaded as shown.

(i) Calculate the support reactions at B and E.

(4 marks)

(ii) Draw the shear force and bending moment diagrams.

(16 marks)

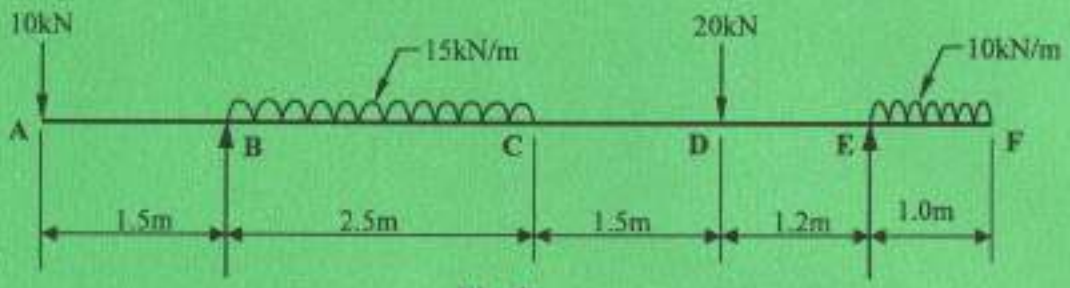


Fig. 4

SECTION B: CONSTRUCTION MATERIALS

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

5. (a) Describe the following methods of heat treatment to steel:

(i) Hardening;
(ii) Tempering;
(iii) Annealing;
(iv) Normalizing. (8 marks)

(b) (i) Differentiate between mild and high carbon steel.

(ii) List **four** uses of high carbon steel. (6 marks)

(c) Explain any **three** types of protection to ferrous metals. (6 marks)

6. (a) Differentiate between softwood and hardwood giving **four** examples of each. (6 marks)

(b) Sketch and describe the following methods of timber conversion.

(i) Radial method;

(ii) Through and through method. (6 marks)

(c) (i) Explain the term "dry rot" in timber. (2 marks)

(ii) State **four** ways of preventing "dry rot" in timber. (4 marks)

(d) Explain any **one** method of seasoning timber. (2 marks)

7. (a) Describe the geological formation of rocks. (9 marks)

(b) List **five** properties of natural stones. (5 marks)

(c) Explain any **three** factors that contribute to the deterioration of stones. (6 marks)

8. (a) (i) State **four** properties of Bitumen. (4 marks)

(ii) State **four** uses of bituminous products. (4 marks)

(b) Describe the process of glass manufacture. (4 marks)

(c) Describe the following methods of manufacturing glass products:

(i) Blowing;

(ii) Drawing;

(iii) Grinding and polishing;

(iv) Moulding.

(8 marks)