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**STRUCTURES I AND
CONSTRUCTION MATERIALS I**

Oct./Nov. 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN BUILDING CONSTRUCTION
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE**

MODULE I

STRUCTURES I AND CONSTRUCTION MATERIALS I

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Scientific calculator.

This paper consists of EIGHT questions in TWO sections: A and B.

Answer FIVE questions TWO from section A and TWO from section B and ONE other question from either section.

All questions carry equal marks.

Maximum marks for each part of a question are indicated.

Candidates should answer the questions in English.

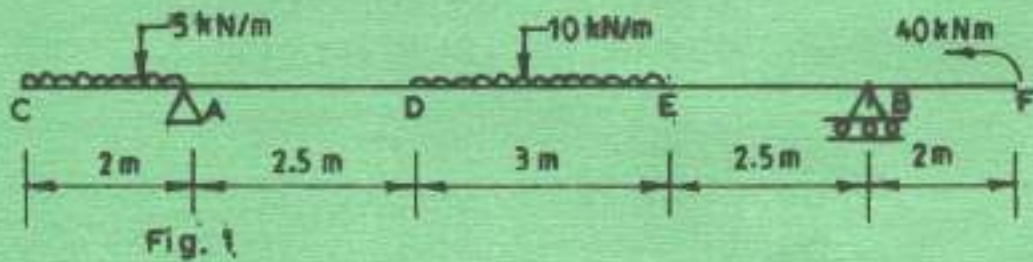
This paper consists of 6 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

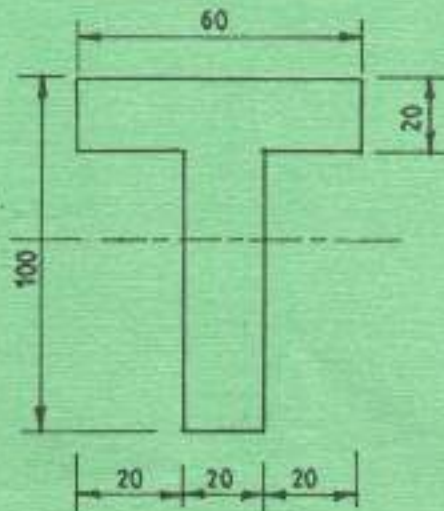
SECTION A : STRUCTURES I

Answer at least TWO questions from this section.

1. (a) Show that the maximum uniformly distributed load for a simply supported beam is given by $WC^2/8$. (3 marks)
- (b) Figure 1 shows a loaded beam:
- (i) plot the shear force diagram and bending moment diagram;
- (ii) calculate the point of contraflexure from left hand end. (17 marks)



2. (a) Figure 2 shows the cross section of a beam. Plot the horizontal shear stress distribution given a shear force of 35 kN. (15 marks)



- (b) Calculate the moment of resistance of the beam section if the stresses in upper and lower sections are limited to 10 N/mm^2 and 25 N/mm^2 respectively. (5 marks)

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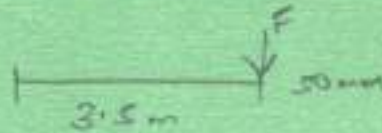
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- (d) (i) State **four** assumptions made in Eulers formula.
- (ii) Calculate the load on a column 50 mm diameter that is fixed on one end and free in the other using Eulers formula. The column is 3.5 m long.

$E = 210 \text{ kN/mm}^2$



(8 marks)

$E = \frac{\sigma}{\text{strain}}$
 $\frac{AD\Delta E}{L} = \frac{FL}{ADL}$

SECTION B : CONSTRUCTION MATERIALS

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

5. (a) Describe the following methods of fabricating plastics:
- (i) transfer moulding;
 - (ii) calendering. (4 marks)
- (b) Differentiate between the following types of plastics:
- (i) thermoplastics;
 - (ii) thermosetting plastics. (4 marks)
- (c) Explain the uses of the following types of cement:
- (i) rapid hardening;
 - (ii) high alumina cement;
 - (iii) pozzolana;
 - (iv) coloured. (4 marks)
- (d) With the aid of a sketch, outline the procedure of manufacture of cement using the dry process. (8 marks)

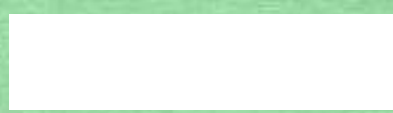
6. (a) (i) Define the term 'quarrying'. *this is the extraction of rocks from the earth surface*
- (ii) Describe **two** methods of quarrying. *1) blasting - in air or explosives* (5 marks)
2) quarrying - this is done by digging out rocks using the crane
- (b) Describe the **three** geological classifications of stones giving one example of each. (9 marks)

1) igneous - 1 mark
2) metamorphic
3) sedimentary - 7/24

W
Plasticize

Good brick
1. good appearance
2. durable
3.

Bricks Manufacturing
1. good appearance
2. durable
3. strength
4. soundness
5. durability




- (c) (i) State four properties of a good brick. (4 marks)
(ii) outline the procedure for the manufacture of bricks. (6 marks)

7. (a) Define the listed terms as used in timber:

- (i) seasoning; - the extraction of water from the timber that has been cut
(ii) live knot; - this are defects that can grow back given good amount of time
(iii) dead knot; - this are defects that cannot regrow back within the tree
(iv) dry rot. - this is a defect occurring due to the normal growth of the part of the tree (4 marks)

(b) With the aid of sketches, describe the stated defects in timber:

- (i) star shake; 
(ii) twisting;
(iii) cupping. (6 marks)

(c) Differentiate between the hard wood and soft wood timber giving one example of each: (4 marks)

Hard wood - Mahogany
Softwood - pine

Hard wood - wood found in dry areas that does not contain heart wood
Softwood - wood found in wet areas with white softwood is wood located with heart that has a lot of water and contains a lot of tannin

- (d) (i) Explain two functions of paint. (4 marks)
1) beauty purposes 2) hygiene
(ii) Describe four main ingredients of paint. - inert filler - 11 (6 marks)
1) oil 2) water 3) colour pigment

8. (a) Explain the following types of bituminous materials:

- (i) native asphalt;
(ii) cut back asphalt;
(iii) asphaltite. (6 marks)

- dust prevention
- prevent moulding
- sound proof insulation
- shock resistant

- (b) (i) State four properties of glass; (6 marks)
(ii) State four uses of bitumen. (4 marks)
1) road construction
2) construction of gutters
3)

Types of bitumen
Hot
mineral bit

(c) Describe the following forms of glass:

(i) pressed;

(ii) laminated;

(iii) glass fibre.

(6 marks)

(d) Differentiate between natural and synthetic rubber.

(4 marks)

more carbon
to darken it

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