



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

***Faculty of Engineering & Technology***

**DEPARTMENT OF CIVIL AND BUILDING ENGINEERING**

**CERTIFICATE IN ARCHITECTURE (09)**

**END OF SEMESTER EXAMINATIONS**

**APRIL/MAY 2010 SERIES**

**STRENGTH OF MATERIAL I**

**TIME: 2 HOURS**

**Instructions to Candidates**

You should have the following for this examination:

- Answer booklet
- Mathematical tables/Calculator
- Graph Paper

This paper consists of **FIVE** Questions  
Answer question **ONE** and any other **TWO** Questions.  
Maximum marks for each part of a question are as shown.

**Question ONE (Compulsory – 30 Marks)**

- (a). State Hookes law and show the mathematical expression and Parameters associated with it. **(2½ Marks)**
- (b). A specimen has initial gauge length of 55mm and a cross-sectional area of 150mm<sup>2</sup>. A test on the specimen gave the following results.

Load (KN)	0	10	20	30	35	38	40
Extension (mm)	0	0.075	0.15	0.23	0.30	0.38	0.60

Draw the stress-strain graph and hence determine 0.2% proof stress.

**(27½ Marks)**

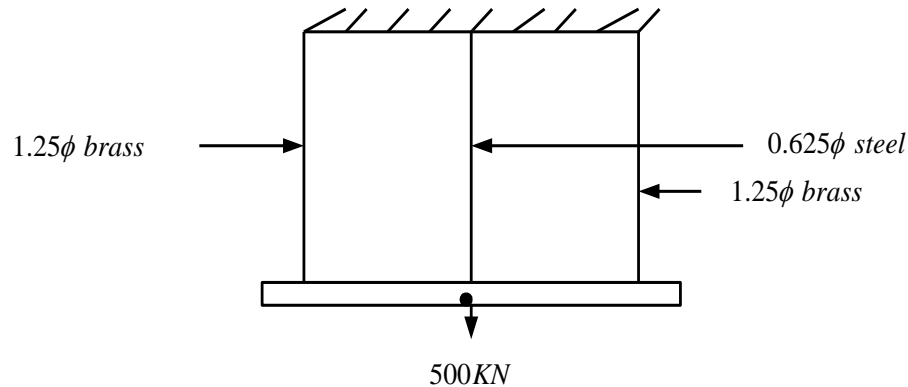
**Question TWO**

- (a). A uniform bar weighing 500N is held in a horizontal position by three vertical wires as shown in Fig. 1 below. The outer wires are of 1.25mm diameter brass and the centre one is 0.625mm steel.

Estimate the stress in the wires if:

$E_s = 200KN / mm^2$  and beam remained horizontal.

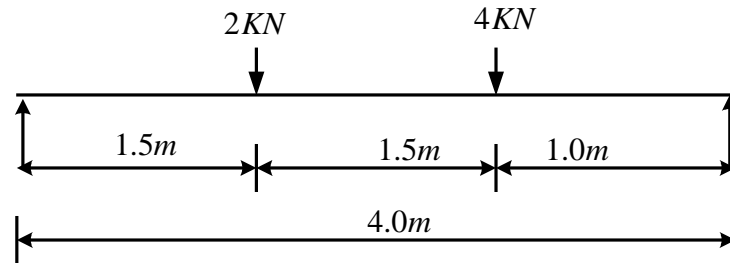
$E_b = 85KN / mm^2$



**Fig. 1**

**(10 Marks)**

- (b). A simply supported beam in Fig. 2 is 4m long, it is subjected to two point loads of 2kN and 4kN each at a distance of 1.5m and 3.0m from the left end. Draw the shear force diagram and bending moment diagram for the beam, giving values for specific points.

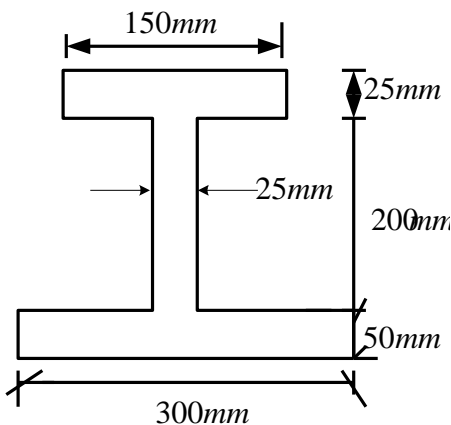


**Fig. 2**

**(10 Marks)**

**Question THREE**

- (a). Give the **FIVE** assumptions of the theory of simple bending. **(5 Marks)**
- (b). An I-Section in Fig. 2 is made up of three rectangles i.e. two flanges having thin long horizontals and one web connecting them, having its long side vertical. The top flange section is 150 x 25mm and that of the bottom flange is 300 x 50mm. The web section is 200mm deep and 25mm broad. Find the height of the cg of the area of this cross section from the bottom of the lower flange.

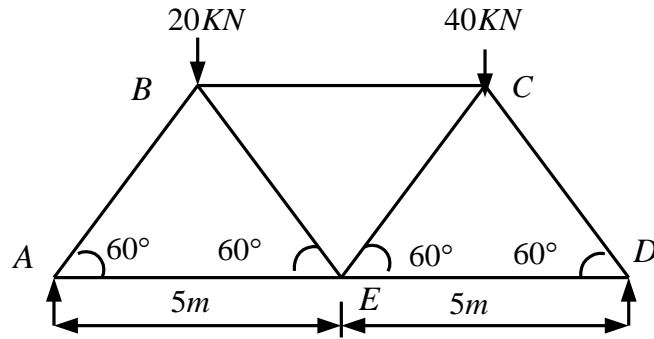


**Fig. 2**

**(15 Marks)**

#### **Question FOUR**

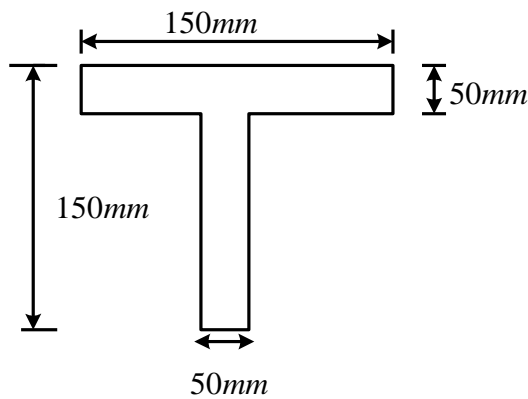
The figure 3 shows a warren girder consisting of seven members each 5m length, freely supported at its end points. The girder is loaded at points B and C as shown. Using any analytical method. Find the force of all the members indicating whether the force is compressive or tensile.



**(20 Marks)**

#### **Question FIVE**

The wooden planks 150mm x 150mm each are connected to form T- Section of beam. If the moment of 3.4kN/m is applied around horizontal neutral axis, indicating tension below the neutral axis, find the stress at the extreme fibres of X-Section. Also Calculate the total tensile force on the X-Section.



**Fig. 4**

**(20 Marks)**