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). Sketch a typical stress-strain graph for mild steel and hence explain fully the following terms with it.

(i). Limit of proportionality
(ii). Elastic limit
(iii). Yield stress
(iv). Ultimate stress
(v). Breaking strength

(12 Marks)

(b). A steel rod is loaded as shown below in Figure 1. Determine the change in length of the bar, given that the steel diameter is 25mm and the modulus of elasticity $E = 200KN/mm^2$ **(8 Marks)**

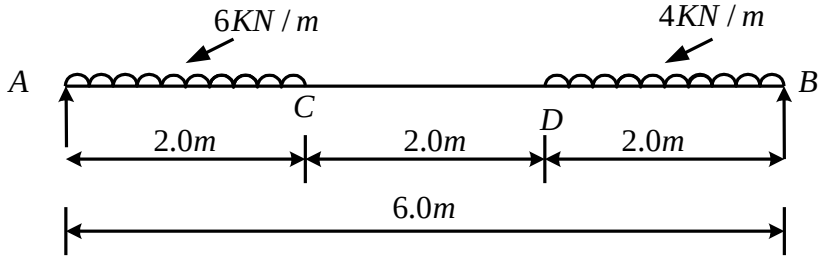
(c). A concrete column 50cm square is reinforced with four steel rods each 2.5cm in diameter. Embedded in the concrete near the corners of the square.

Estimate the compressive stress in the steel and concrete induced by the load of 1000KN on the column.
Assume : E_s = 200KN/mm^2
E_c = 14KN/mm^2

(10 Marks)

Question TWO

A 6m span simply supported beam is loaded as shown below in figure 3. Draw the shear force, bending moment diagram and hence calculate the value of maximum bending moment of the beam.



(20 Marks)

Question THREE

(a). The figure (2) shown below is the section of the beam. Determine the centre of gravity by the method of moments.

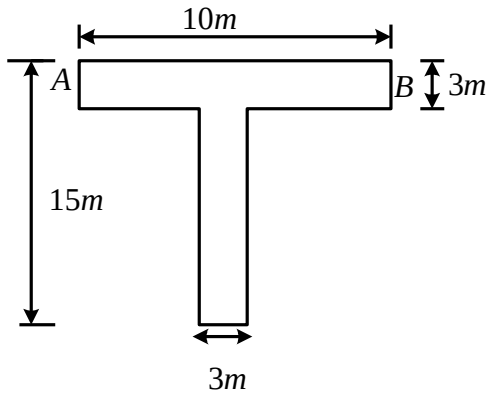


Fig. 2

(15 Marks)

(b). Define the principle of superposition giving the mathematical expression and parameters used. **(5 Marks)**

Question FOUR

The beam shown below is subjected to a bending moment of 50,000 KN/m at its neutral axis. Find the maximum stress induced in the beam.

(20 Marks)

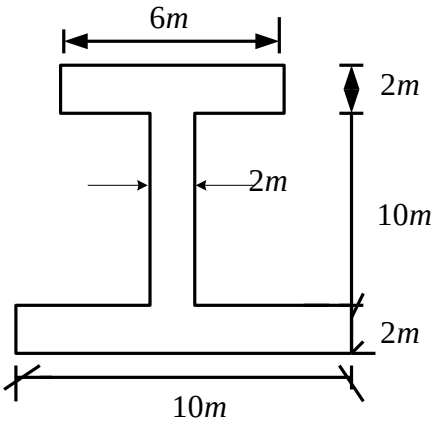


Fig. 3

Question FIVE

The figure 4 below shows a warren Girder loaded at point E, D and F, and freely supported at its ends. Using an appropriate method of analyzing forces in roof structure, determine the member forces indicating whether the members are in tension or in compression. **(20 Marks)**

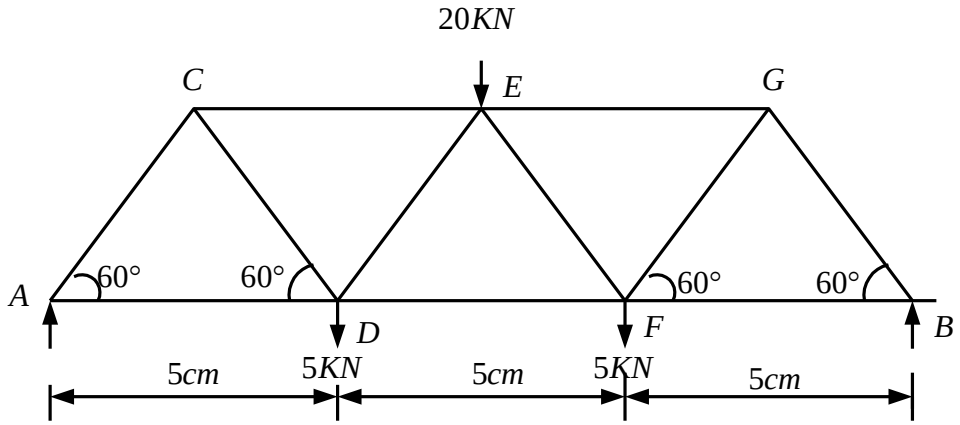


Fig. 4

Appendix

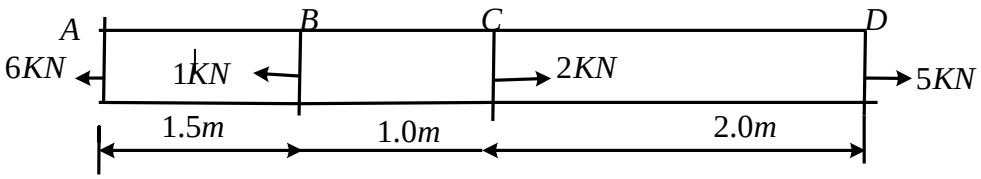


Fig. 1

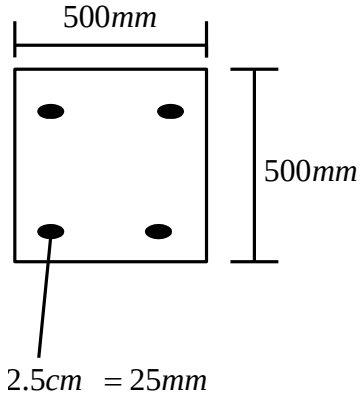


Fig. 2