



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

(INSTITUTION BASED EXAMINATION)

EBC 2203: STRENGTH OF MATERIALS

SERIES: MARCH 2017

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Pocket calculator

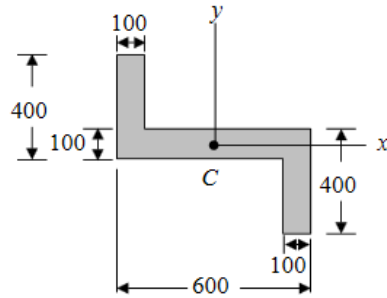
This paper consists of **FIVE** questions. Attempt any **THREE** questions

Do not write on the question paper

Mobile Phones are NOT allowed inside the examination room

QUESTION ONE

Determine the moments of inertia of the beam's cross-sectional area shown about the x and y centroidal axes for the figure Q1 in the next page.



Dimension in mm

Figure Q1

(20 marks)

QUESTION TWO

- a) Draw the shear and bending moment diagrams for the beam and loading shown in figure Q2.

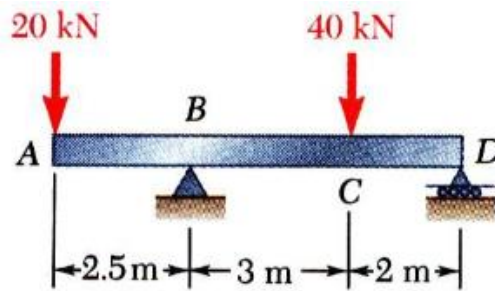


Figure Q2

(20 marks)

QUESTION THREE

- a) Find forces in members AB, AD, AC, EG, FG, FH in the truss shown in figure Q3 below.

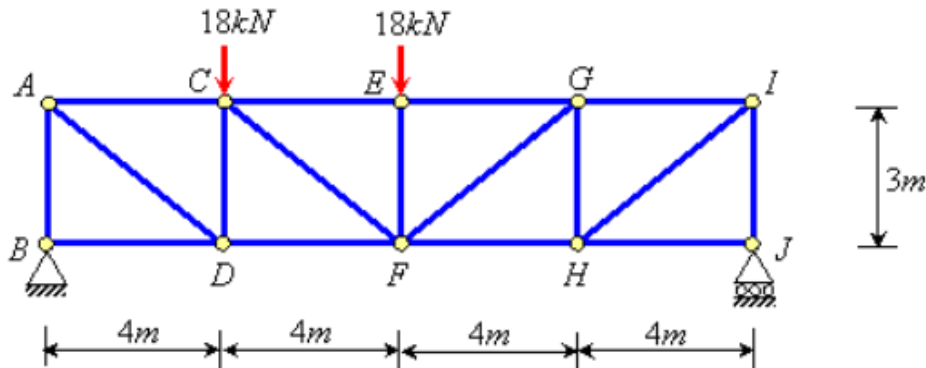


Figure Q3

QUESTION FOUR

The following figures were obtained in a standard tensile test on a specimen of low carbon steel. The diameter of the specimen was 11.28mm, gauge length 56mm and minimum diameter after fracture was 6.25mm. Using the above information and the table of results below, produce:

- i) A load/extension graph over the complete test range
- ii) A load /extension graph to an enlarged scale over the elastic range of the specimen.

Load (kN)	2.47	4.97	7.4	9.86	12.33	14.8	17.27	19.74	22.2	24.7
Extension (m $\times 10^{-6}$)	5.6	11.9	18.2	24.5	31.5	38.5	45.5	52.5	59.5	66.5
Load (kN)	27.13	29.6	32.1	33.3	31.2	32	31.5	32	32.2	34.5
Extension (m $\times 10^{-6}$)	73.5	81.2	89.6	112	224	448	672	840	1120	1680
Load (kN)	35.8	37	38.7	39.5	40	39.6	35.7	28		
Extension (m $\times 10^{-6}$)	1960	2520	3640	5600	7840	11200	13440	14560		

Table Q4

Using the two graphs and other information supplied, determine the values of:

- a) Young's modulus of elasticity
- b) The ultimate tensile stress
- c) The stress at the upper and lower yield points
- d) Percentage reduction of area
- e) Percentage elongation
- f) Nominal and actual stress at fracture.

QUESTION FIVE

- a) Determine the forces in the members of the Warren truss shown in Fig. Q5. The force diagram is as shown. All members are 1 m long. (Use **ANY analytical method**)

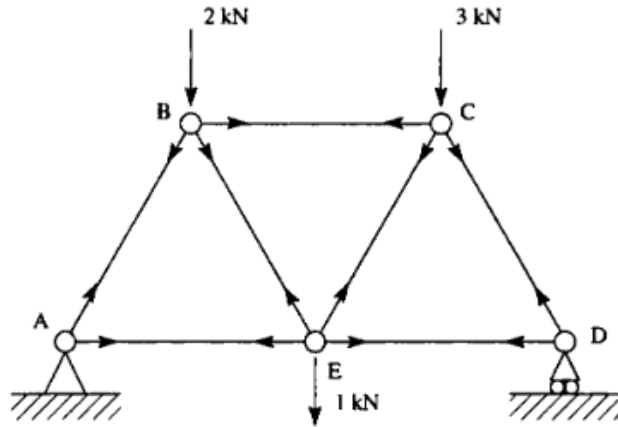


Fig. Q5

(10 marks)

- b) Figure Q5(b) is a simply supported beam loaded as shown. Find point of the maximum bending moment.

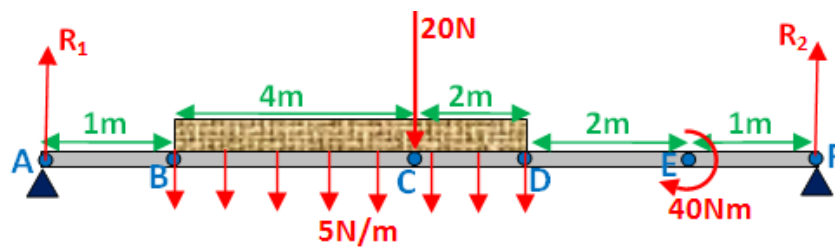


Figure Q5 (b)

(10 marks)