MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING MODULE I

2707 / 103 ST: STRUCTURES I

DATE:26/04/2019 **TIME: 8:30 – 11:30am**

INSTRUCTIONS:

- *This paper consists of **Five** questions.*
- *Answer **All** questions.*
- *All questions carry equal marks.*
- *Maximum marks for each part of the question are as shown.*

1. A beam is loaded as shown in figure 1.

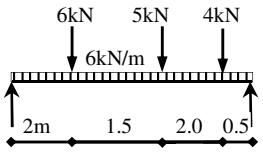

Fig. 1

a) Draw the shear force and bending moment diagrams

b) Determine the position of the maximum sagging bending moment

c) Calculate the maximum sagging bending moment (20 marks)

2. Figure 2 shows the cross section of a structural member.

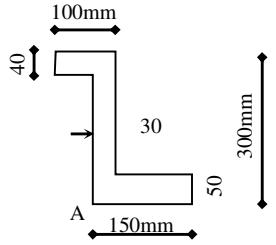

Fig. 2

a) Determine the position of the centroid.

b) Calculate the values of I_{xx} and I_{yy}

c) Calculate the values of r_{xx} and r_{yy}

d) Calculate the section moduli Z_{xx} and Z_{yy} about the bottom left corner A. (20 marks)

3.

a) State ***Five*** assumptions made in the theory of simple bending. (5 marks)

b) A timber beam 150 X 300mm deep is reinforced with two 125 X12mm thick steel plates bolted firmly along each edge as shown in figure 3. The safe stress in the steel is 140N/mm^2 and that in timber is 7N/mm^2. Calculate the moment of resistance of the beam.

E_s = 205kN/mm^2; E_t = 8.2kN/mm^2 (15 marks)

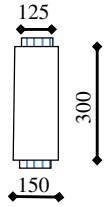

Fig. 3

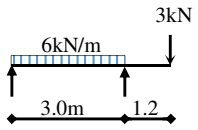

Fig. 4

4. A timber beam having a rectangular cross section 240 X 85mm wide is loaded as shown in figure 4. Determine the following:

a) The maximum bending stress in the beam

b) The bending stress in the beam at a point 0.2m to the left of point B and 30mm below the upper edge of the section. (20 marks)

5. Figure 5 shows the cross section of a beam carrying a uniformly distributed load over a span of 3.6m.

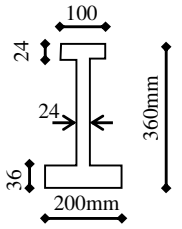

Fig. 5

a) Calculate the position of the neutral axis
b) Determine I_{xx}
c) Determine the values of Z_{xx}
d) Calculate the safe uniformly distributed load that the beam can carry if the tensile stress is not to exceed $20N/mm^2$ and the compressive stress $100N/mm^2$. (20 marks)