MACHAKOS UNIVERSITY

University Examination 2019/2020

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD 204: THEORY OF STRUCTURES I

DATE: 3/12/2019 **TIME: 8.30-10.30 AM**

INSTRUCTIONS

- *This paper consists of **Five** questions.*
- *Answer question **ONE** and any other **TWO** questions*
- *Maximum marks for each part of the question are as shown.*

QUESTION ONE (30 MARKS) (COMPULSORY)

a) A timber strut of cross section size 100 X 50mm has an effective length of 1.5m. Calculate the following values:

i. Least radius of gyration

ii. Slenderness ratio (4 marks)

b) Figure 1 shows a 3m long T section to be used as a strut with both ends hinged.

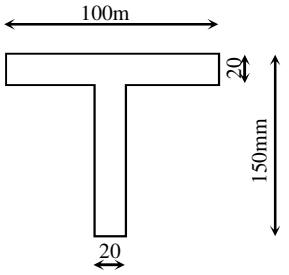

Fig. 1

Using Euler's formula, calculate the critical load that the strut can bear.

E=200kN/mm^2 (9 marks)

c) A column carries a load P, of 200kN at an eccentricity of 30mm to both principle axes as shown in figure 2.

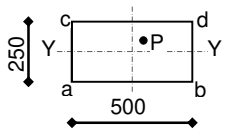

Fig. 2

Calculate the stresses at each of the four corners of the section (9 marks)

d) Figure 3 shows a simply supported beam carrying a concentrated load at mid span. Using Mohr's theorems determine the maximum slope and deflection. (8 marks)

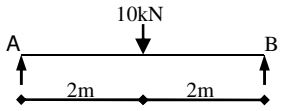

Fig. 3

QUESTION TWO (20 MARKS)

A steel section of 20mm uniform thickness carries three loads as shown in figure 4. Calculate the stresses at the four extreme corners of the column

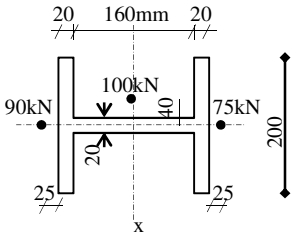

Fig. 4

QUESTION THREE (20 MARKS)

Figure 5 shows a simply supported beam carrying a concentrated load at mid span.

a) Using Macaulay's method determine the maximum deflection

b) Using Mohr's theorems determine the slope and deflection at the quarter span point marked C

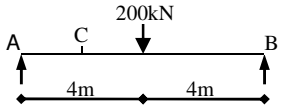

Fig. 5

QUESTION FOUR (20 MARKS)

Using Macaulay's method, calculate the deflection under each of the point loads acting on the beam shown in figure 5. EI = 15 X 10^3 kNm^2

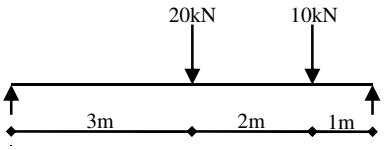

Fig. 5

QUESTION FIVE (20 MARKS)

A rectangular column of cross section 400 X 300mm carries two eccentric loads P_1=50kN and P_2= 80kN at eccentricities as shown in figure 6.

Calculate the stresses at all corners of the column.

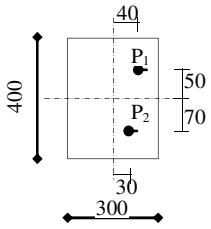

Fig. 6