MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

DIRECTORATE OF TVET

THIRD YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN BUILDING TECHNOLOGY

DIPLOMA IN CIVIL ENGINEERING

2705 & 2707 - 302: STRUCTURES III

DATE: 28/7/2022 **TIME: 8:30 – 11:30 AM**

INSTRUCTIONS

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

QUESTION ONE

a) Using suitable sketches, explain THREE modes of failure of a riveted joint. (6 marks)

b) State six conditions that cased sections should meet in accordance with BS 5950. (6 marks)

c) A single riveted lap joint is made using 10mm thick plates with 20 mm nominal diameter rivets

Determine the strength of the rivet joint if the pitch of the rivets is 60mm

Take permissible stresses as

Shearing	60 N/mm^2
Bearing	150 N/mm^2
Tensile	80 N/mm^2

(8 marks)

QUESTION TWO

A suspended concrete floor slab 150mm thick is supported on simply supported universal beams of effective length 8m spaced at 3m centres. Select a suitable UB section for the internal beams in grade S275 steel and hence check for bending, shear and deflection.

Imposed load 3kN/m^2, finishes 0.8kN/m^2, E=210kN/mm^2 (20 marks)

QUESTION THREE

A simply supported universal beam supports uniformly distributed characteristic dead and imposed loads of 2kN/m each as well as characteristic imposed and dead point loads which are equidistant over an effective span of 9m as shown in figure 1. Assuming that the beam is fully laterally restrained and normal loading conditions, select a suitable universal beam in grade S275 steel to satisfy bending, shear and deflection. E=205kN/mm^2

(20 marks)

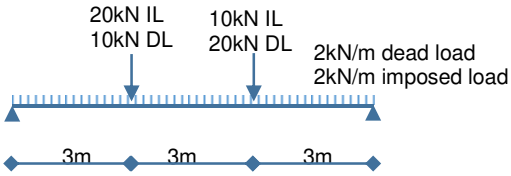

Fig. 2

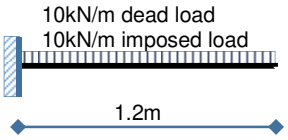

Fig. 1

QUESTION FOUR

A cantilever beam of effective length 1.2m is built into a concrete wall as shown in figure 2. It supports characteristic dead and imposed loads of 10kN/m and 10kN/m respectively. Select a suitable universal beam section in grade S275 steel to satisfy bending, shear, shear buckling and deflection. E=205kN/mm^2 (20 marks)

QUESTION FIVE

A timber section 150 X 50mm of strength class C16 and effective span 3.0m is used as a simply supported beam. Assuming the beam is fully laterally restrained, check the adequacy of the timber beam in bending, bearing, shear and deflection given the following data:

Dead load = 0.5kN/m

Imposed load = 1.5kN/m

Bearing length = 100mm

Assume long term loading

Take all K factors as 1.0 (20 marks)

QUESTION SIX

A universal column supports a factored axial load of 1000kN and factored eccentric loads of 70kN, 80kN and 100kN as shown in figure 3. The column is 5m long and it is effectively held in position and partially restrained at both ends. Design the uncased column in grade S275(grade 43) steel. Ignore the self-weight of the column.

(20 marks)

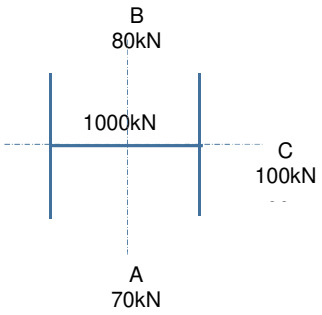

Fig. 3

QUESTION SEVEN

A cased universal column of serial size 254 X 254 X 107 kg/m in grade S275 steel carries factored loads as shown in figure 4.

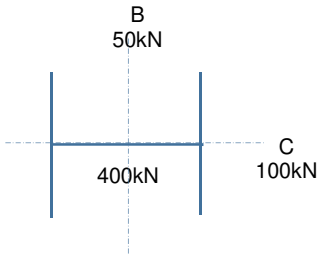

Fig. 4

The effective length of the column is 3.6m.

Check the adequacy of the column. f_{cu} =25N/mm^2. (20 marks)