A Centre of Excellence

TECHNICAL UNIVERSITY OF MOMBASA (TUM)

UNIVERSITRY REGULAR EXAMINATIONS FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4316: STRUCTURAL STEEL DESIGN

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

TIME: 2 HOURS

Instructions to Candidates:

1. You should have answer booklet for this examination.
2. This paper contains **FOUR** questions
3. Answer question **ONE** any **TWO** questions.
4. Marks for each question are indicated in the parenthesis.
5. Examination duration is **2 Hours**

Question One (20 marks)

TCV 4316: STRUCTURAL STEEL DESIGN

a) Briefly explain disadvantages of using structural steel as a construction material.

[10 marks]

b) List essential conditions leading to brittle fracture in structural steel [**6 mark**]

c) Describe the following failure modes of steel connections with the help of sketches.
   - Single shear failure of bolt
   - Double shear failure [**4 marks**]

Question Two (20 marks)

A beam shown in figure Q2 is part of the structural system of the proposed ladies hostel. The beam is fully laterally restrained and that it sits on 125 mm bearings at each end. Select a suitable beam section using S 235 steel to support the loads shown. Carry out the following suitability checks:

- Strength classification
- Section classification
- Resistance of the cross-section
- Shear buckling resistance
- Flange induced buckling
- Deflection

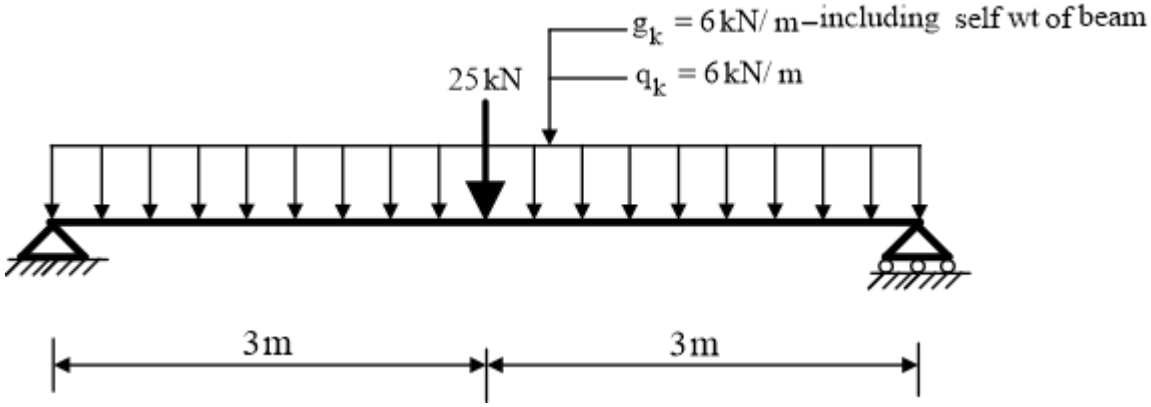

Figure Q2

Question Three (20 marks)

Select a suitable column section in S275 steel to support the ultimate loads from beams A and B shown in figure Q3. Assume the column is 8 m long and is pinned at the top and fixed at the bottom. Assume the self-weight of the column to be 7kN

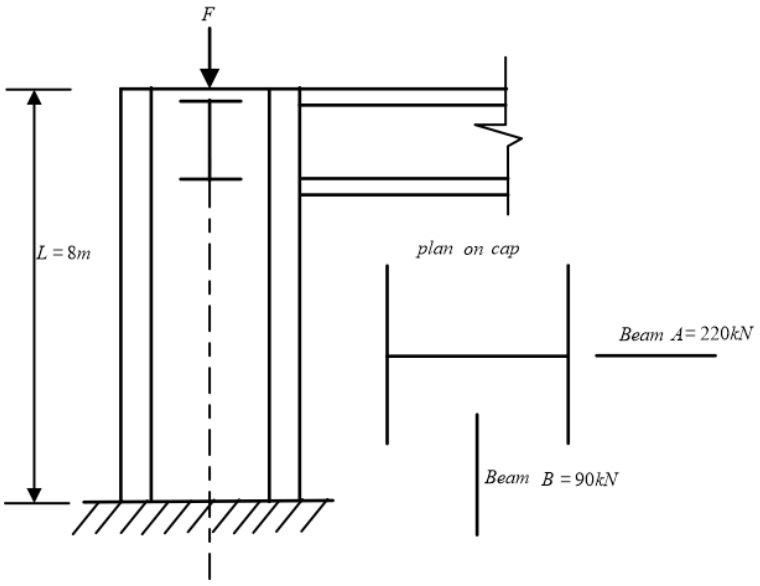

Figure Q3

Question Four (20marks)

Calculate the design resistance of the connection detail shown in figure Q4. The cover plates are made of S275 steel and connected with either

a) non-preloaded bolts of diameter 20 mm and class 4.6 or **[14 marks]**

b) Prestressed bolts of diameter 16 mm and class 8.8 **[6 marks]**

Assume that in both cases, the shear plane passes through the unthreaded portions of the bolts.

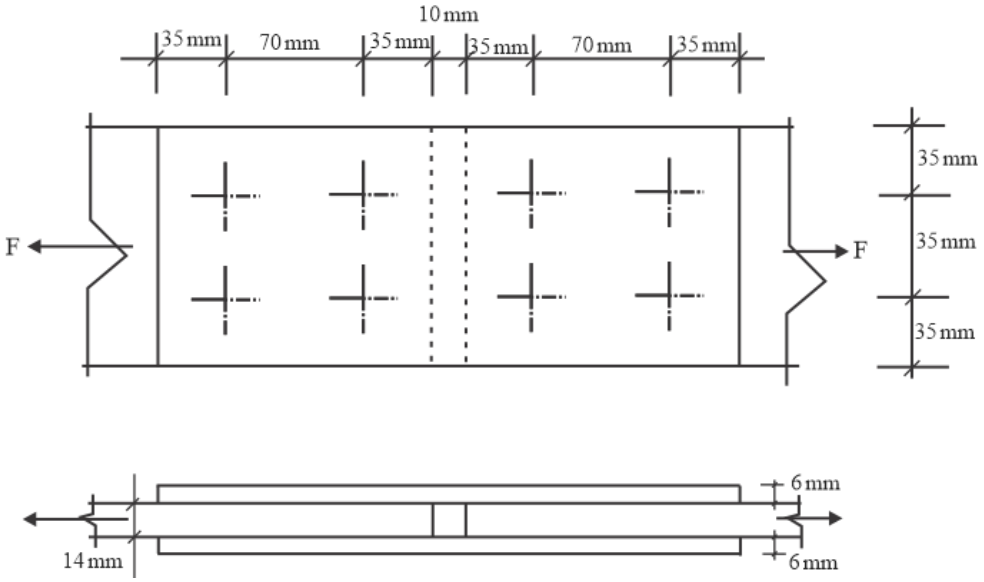

Figure Q4