A Centre of Excellence

TECHNICAL UNIVERSITY OF MOMBASA (TUM)

UNIVERSITRY REGULAR EXAMINATIONS FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4316: STRUCTURAL STEEL DESIGN

END OF SEMESTER EXAMINATION
SERIES: JANUARY 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**

TCV 4316: STRUCTURAL STEEL DESIGN

Question One [20 marks]

a) Briefly explain advantages of using structural steel as a construction material. **[12 marks]**

b) Durability is a service limit state. Outline the durability factors considered at the design stage. **[2 marks]**

c) Briefly describe the four classes of steel sections. **[6 marks]**

Question Two [20 marks]

1. A cantilever beam is needed to resist the loading shown (figure Q2). Select a suitable UB section in S 275 steel to satisfy bending and shear criteria only assuming full lateral restraint.

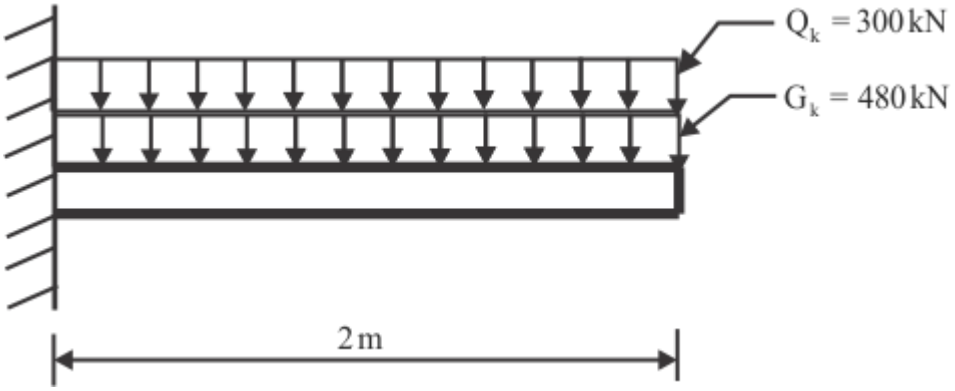

Figure Q2

Question Three [20 marks]

Check the suitability of the $305 \times 305 \times 158$ kg/ m UC (figure Q3) section in S275 steel to resist a design axial compression force of $100\,kN$. Assume the column is pinned at both ends and that its height is 8m.

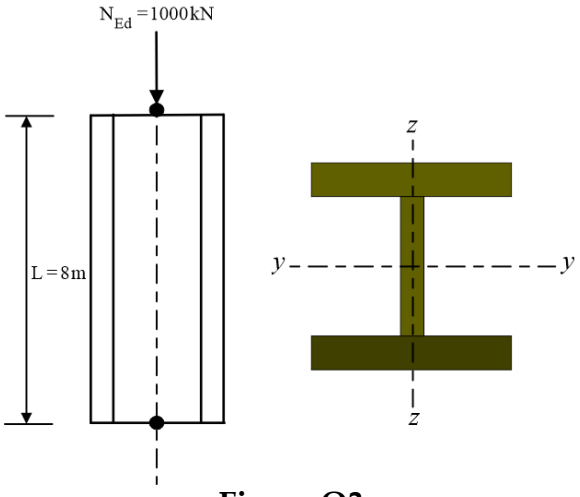

Figure Q3

Question Four [20 marks]

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 22 mm and class 4.6 **[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.

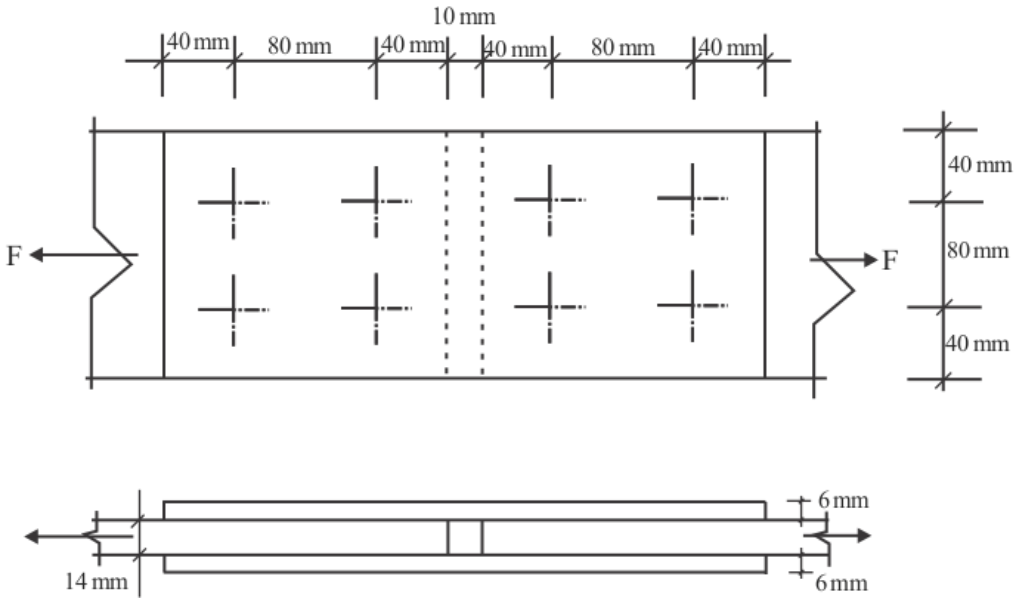

Figure Q4