



TECHNICAL UNIVERSITY OF MOMBASA

**SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:**

**BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING
TCV 4316: STRUCTURAL STEEL DESIGN**

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2024

TIME: 2 HOURS

Instructions to Candidates:

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

Question One [20 marks]

- (a) Outline FOUR failure criteria for steel [**4 marks**]
- (b) State alternative combinations of actions for ultimate limit state and serviceability limit state [**6 marks**]
- (c) Describe the principal serviceability limit states recommended in EC 3 [**4 marks**]
- (d) Using a sketch illustrate Web bearing and buckling failures in steel beams [**6 marks**]

Question Two (20 marks)

A steel beam of $356 \times 171 \times 51$ kg/m UB section in S275 steel loaded by uniformly distributed loading $g_k = 8 \text{ kN/m}$ and $q_k = 7 \text{ kN/m}$ as shown in figure Q2 was used as the structural support system of a graduation pavilion at TUM. Check the suitability of the section to support the loading without failure. Assume that the beam is fully laterally restrained and that the beam sits on 100 mm bearings at each end. Ignore self-weight of beam.

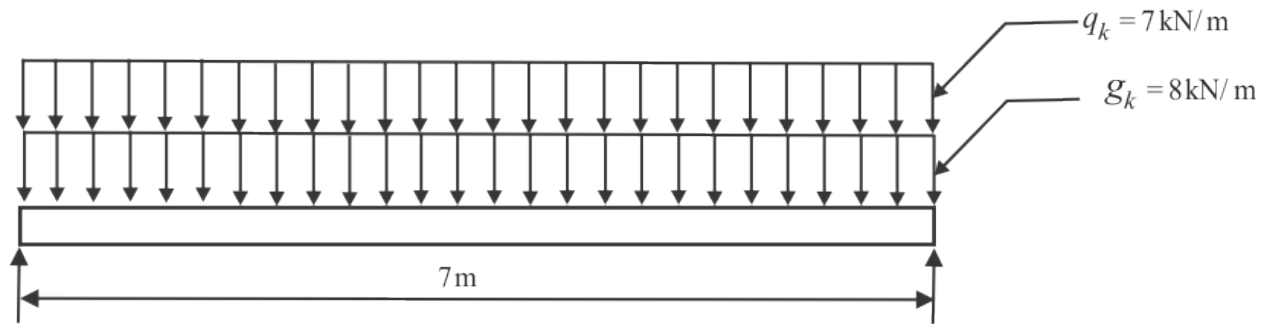


Figure Q2

Question Three (20 marks)

A $203 \times 203 \times 86$ kg/m UC section in S275 steel used as part of the structural support system of an engineering workshop at TUM is to resist a design axial compression force of 1600 kN as shown in figure Q3. Assume the column is pinned at both ends and that its height is 6m. Check the suitability to resist a design axial compression force.

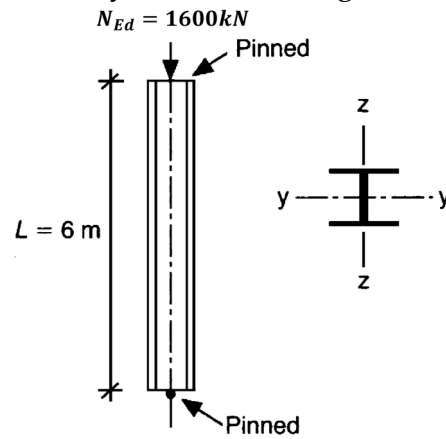


Figure Q3

Question Four (20 marks)

If the beam in figure Q4 is to be connected to a column using eight class 8.8, M20 bolts. Calculate the maximum shear resistance of the connection.

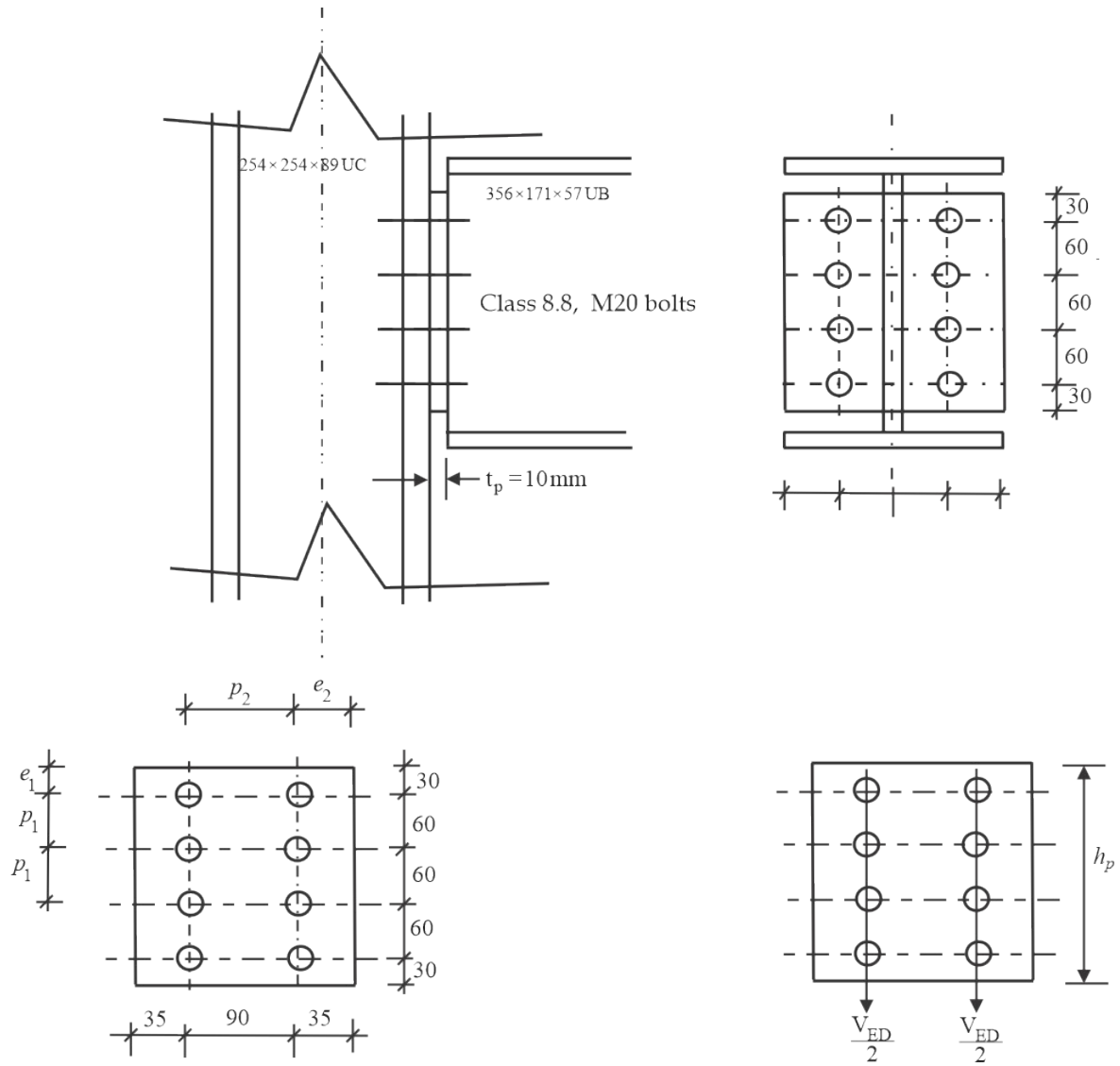


Figure Q4