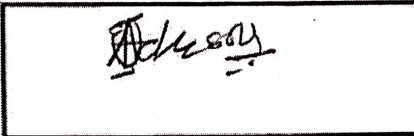




**FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
FIRST SEMESTER EXAMINATION (MARCH
2018)
2017/2018 ACADEMIC SESSION**


HOD'S SIGNATURE

Instructions:

- 1) Attempt any FIVE questions.
- 2) Students are allowed to use BS5950: Part I.
- 3) Time Allowed: 2.5Hours
- 4) **SEVERE PENALTIES APPLY FOR MISCONDUCT,
CHEATING, POSSESSION OF UNAUTHORIZED
MATERIALS DURING EXAMINATION**

Course Title: DESIGN OF STRUCTURES II

Course Code: CVE 407

FACULTY OF ENGINEERING
 DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
 FIRST SEMESTER 2017/2018 EXAMINATION
 CVE 407: DESIGN OF STRUCTURES II

INSTRUCTIONS: Attempt any FIVE questions.
 Students are allowed to use BS5950: Part I.
 TIME ALLOWED: 2.5 Hours.

Question 1 (25 marks)

- a) A 150 x 150 x 18mm angle section in grade S275, which is connected by one leg, is to be used as a tie. Firstly, the connection will be made by a welded gusset plate and secondly by two M24 bolts in a line across the width of the member. Determine the tension capacity in each case.
- b) Determine the tension capacity of the steel plate shown in Figure Q1, if $t = 25$ mm, $h = 500$ mm $d = 26$ mm and the steel plate is of grade S460.

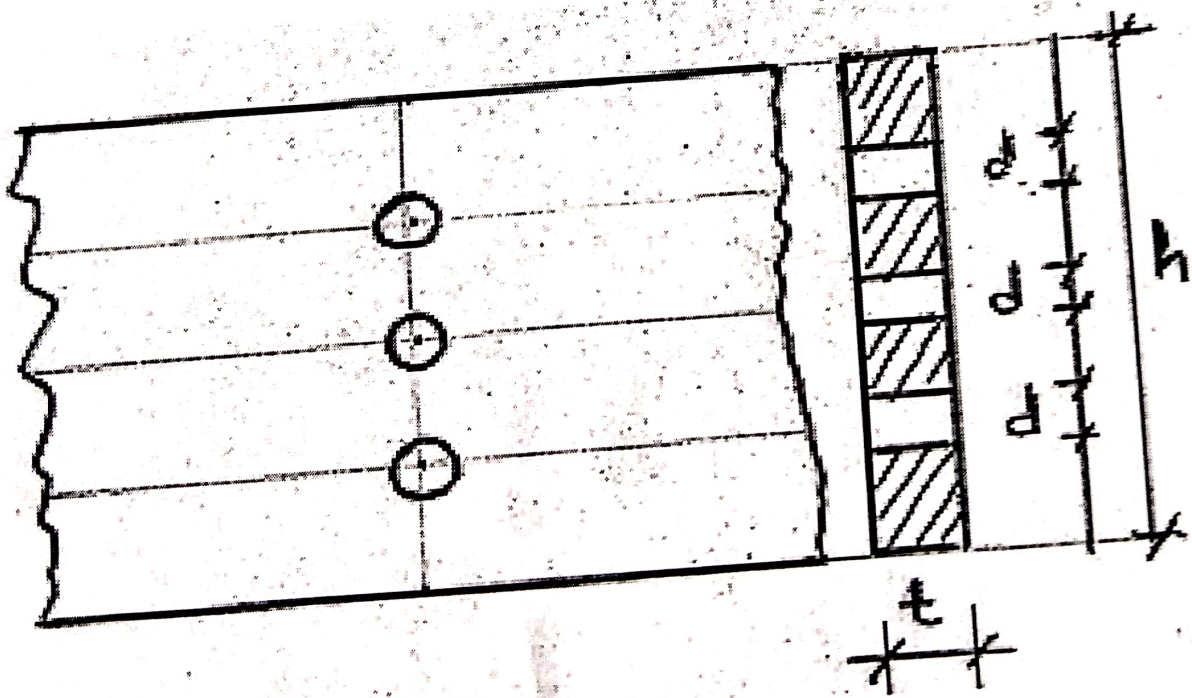


Figure Q1: angle section in grade S275

Question 2 (25 marks)

Determine the moment capacities M_x of the following structural sections.

- A 457 x 152 x 82 UB in steel grade S275, subjected to pure bending.
- A 457 x 152 x 82 UB in steel grade S275, subjected to bending plus 700 kN axial compression.
- A 254 x 102 x 28 UB in steel grade S275, subjected to pure bending.
- A 254 x 102 x 28 UB in steel grade S275, subjected to bending plus 400 kN axial compression

Question 3 (25 marks)

Design a simply supported beam carrying a concrete floor slab over a span of 9.0 m in grade S355 steel. The slab is assumed to provide full lateral restraint to the beam. The characteristic dead load, which includes an allowance for self-weight, is 15 kN/m, and the characteristic imposed load is 20 kN/m. Hint: Try 533 x 210 x 122 UB.

Question 4 (25 marks)

Check the ability of a 356 x 368 x 202 UC in grade S275, to withstand an axial compressive load of 2000 kN over an unsupported height of 6.0m assuming that both ends are held in position, but are provided with no restraint in direction.

Question 5 (25 marks)

A beam is required to span 8.0m and is to carry three point loads at quarter points, 2.0m apart. Each factored load is 100kN. The three loads are applied to the top flange of the beam and they are free to move laterally. The compression flange is unrestrained over the entire span and free to rotate on plan. At both ends the compression flange has partial torsional restraint against rotation about longitudinal axis provided by connection of bottom flange to supports. Select a suitable UB section in grade S275 steel. Hint: Try 610 x 305 x 179 UB (25marks).

Question 6 (25 marks)

- For a trapezoidal section, show that $M_p = S_x \sigma_y$. (7.5marks).
- What is local buckling? State factors that can influence the occurrence of local buckling in a structural member. (7.5marks).
- Using moment-rotation behavior curve, explain the following terms:
 - plastic section;
 - compact section;
 - semi-compact section;
 - slender section(10marks).