

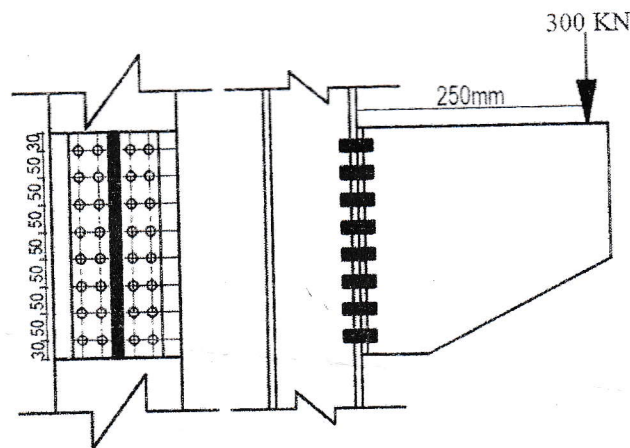
Exam.	Regular (New Course)		
Level	BE	Full Marks	60
Programme	BCE	Pass Marks	24
Year / Part	III / I	Time	3 hrs.

Subject: - Design of Steel Structures (ENCE 303)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ **IS 800:2007, IS 883:2016, IS 875 (Part 3) and IS 808 are allowed**
- ✓ Assume suitable data if necessary.



1. a) Explain the different failure mechanisms of bolted connections in steel structures. [3]
- b) Calculate the tensile force developed in each bolt of the given bracket connection subjected to an eccentric load. The connection consists of M20 grade 4.6 bolts arranged as shown with an edge distance of 30 mm and a pitch of 50 mm. The connection carries a load of 300 kN acting at an eccentricity of 250 mm, as shown in the figure. [9]



2. a) Design a lap connection to join two plates of 200 mm × 10 mm of grade E250 to mobilize full plate tensile strength using shop fillet welds. [4]
- b) A diagonal member of a roof truss carries a maximum pull of 300 kN. Design the section and its connection with a 16 mm thick gusset plate. The length of the connection is limited to 340mm. Design the lug angles also if required. The steel of grade Fe 410 and bolts of grade 4.6 are to be used. [8]
3. A built-up steel column is subjected to the design axial load of 1500 kN. If the unsupported length of the column is 8 m, the ends of the column are fixed, design the column, when the column is made up of two channel sections placed toe-to-toe with a single lacing system. [12]
4. a) Design a simple beam having clear span 3.2 m, supported over wall having thickness 150 mm, beam has to carry imposed load of 20 kN/m (excluding self-weight) and point load from secondary beam 10 kN at mid-span. Consider laterally unrestrained beam. Check for lateral stability of web. [9]
- b) Discuss procedure to estimate size of web and flange plates of a welded plate girder. [3]
5. a) Determine wind pressure on roof of a building having height 15m, length 40m and width 25 m. Building is located in dense forest of a hill having average hill slope 1:1.5, height of hill is 800m and building is located at mid height of hill. Consider normal opening of building. [6]
- b) Design a slab base for column SC 150, subjected to axial compressive load of 300 kN. Slab base is supported over concrete footing of grade M15. [6]