

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: BE
BRANCH: CIVIL ENGINEERING

SEMESTER : IV
SESSION : SP/19

SUBJECT: CE4003 STRUCTURAL DESIGN-I

TIME: 3 Hours

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1. If for the following section (Figure: 01), the permissible stress is 0.66 times of the yield stress, [12]
Determine load factor for the section considering the horizontal axis as reference.

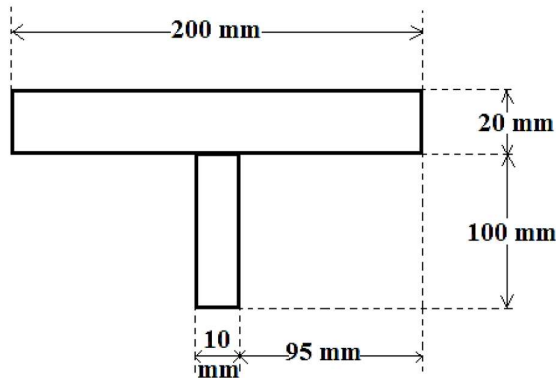


Figure: 01

- Q.2. In a connection, one 12mm thick plate is connected to ISWB 350 as shown in the figure (Figure: 02) [12]
with the help of HSFG bolts of grade 8.8 of nominal diameter 20 mm. If no slip is permitted in the connection and the coefficient of friction is 0.5, What will be the safe load for the connection if the load is applied on the position (180mm away from the longitudinal axis of ISWB 350 along its length) as shown in the figure? Consider steel grade: Fe410

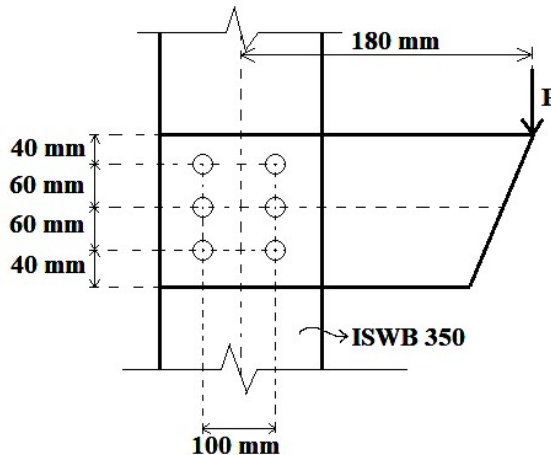


Figure: 02

- Q.3. Consider a column made up of ISHB 300 @ 576.8 B/m which is subjected to a factored axial load of 450 KN. Shear force of 130 KN and Bending moment of 50 KN-m. Design splice plates for the connection using 4.6 grades of bolts. Consider grade of steel as Fe410 [12]
- Q.4. Design a simply supported beam (laterally supported) of span 5 meter which is carrying Dead load (including self weight) of 20 KN/m and Live load of 10KN/m. Consider bearing plates of 120 mm width and 12mm thickness at supports. Check only for the moment capacity, deflection and web crippling. [12]

- Q.5. A welded plate girder is made by adding three plates (Made of Fe410) to a shape of symmetrical I-Section so that the thickness of flange plates are 40mm and the thickness of web is 12mm. the width of the section is 500mm and the depth of the whole section is 1.6 meter. If the girder is subjected to a factored load of 1000KN at the midpoint of the girder span, check the transverse stiffeners requirements for the entire span considering the safety of the web plate. [12]
- Q.6. Choose a combination of I-section and C-section from Indian Standard steel table for a gantry girder of the following data for which only the plastic modulus requirement should be satisfied (Other checks are not required). [12]
Span of gantry girder= 10 meter, Span of crane girder= 15 meter. Capacity of Crane=200 KN; Self weight of crane girder including trolley = 250 KN. Self weight of the trolley= 50 KN; Minimum hook approach= 1 meter; Wheel base of crane=4 meter. Self weight of rail section= 0.5 KN/meter. Weight of gantry girder= 1.5 KN/meter. Use Fe410. Consider, no lateral restrains are there.
- Q.7. Determine combined (Consider dead load, live load and wind load) expected vertical load for the lower most purlin of the following roof truss with Dead load of 3KN for each full panel points and Live load of 2.5KN for each full panel points. [12]
Consider the roof truss for a space research workshop shed which is constructed at Trivandrum (Present name: Thiruvananthapuram) with span of truss 15 meter, spacing of roof trusses 3.5 meter and rise of 3 meter. Height of the truss above ground level is 20 meter; the ground level is having a slope of 1.25 degrees with the horizontal ground. The open wall area is 15%.Each roof truss is having total number of 8 panels. (Accordingly consider total 8 panel points. 4, each side, containing half panels as external panels as assumptions). Assume the life of the roof truss as 50 years. Terrain category=3.

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