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CE 181603

18/06/23

Roll No. of candidate

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BINA CHOWDHURY CENTRAL LIBRARY
(GITM & GIPS)
Azara, Hatkhowapara
Guwahati - 781017

2023

B.Tech. 6th Semester End-Term Examination

STRUCTURAL DESIGN II

(New Regulation (W.e.f. 2017 - 18) & New Syllabus (W.e.f. 2018 - 19))

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct answer for the following multiple choice questions:

(10 × 1 = 10)

(i) Partial safety factors for materials and loads are used in

- (a) Working stress method (b) Limit state method
(c) Ultimate load method (d) All of the above

(ii) Efficiency of welded connection as compared to bolted connection is

- (a) Equal (b) Lesser
(c) Greater (d) All of the above

(iii) The shape factor of a section depends on

- (a) Material properties
(b) Density of section
(c) Geometry of section
(d) Carbon content

(iv) The bolts in an eccentric connection with parallel planes have to resist

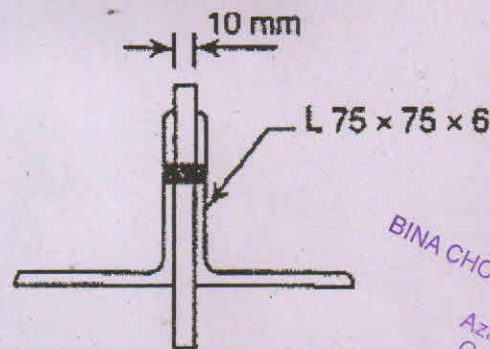
- (a) Shear force
(b) Bending moment and shear force
(c) Shear force and Tension
(d) Torsion and shear force

[Turn over

- (v) The bolts in an eccentric connection with perpendicular planes have to resist
- (a) Shear force
 - (b) Bending moment and shear force
 - (c) Shear force and Tension
 - (d) Shear force and Torsion
- (vi) Loads to be considered for calculation of deflection of a beam are
- (a) Dead load (working)
 - (b) Imposed Load (working)
 - (c) Total load (working)
 - (d) Total load (factored)
 - (e) None of the above
- (vii) Plastic Hinge is a
- (a) Hinge with zero moment
 - (b) Hinge made of plastic
 - (c) Hinge with constant moment
 - (d) None of the above
- (viii) Strut is a _____
- (a) Compression member
 - (b) Tension member
 - (c) Member within a moment resisting frame
 - (d) Flexural member
- (ix) In a column splice, flange splices resist
- (a) Axial compression, Moment and shear
 - (b) Axial compression and shear
 - (c) Axial compression and moment
 - (d) Shear and torsion
- (x) Block shear failure is visible in case of
- (a) Compression failure
 - (b) Serviceability failure
 - (c) Tension failure
 - (d) Bending Failure

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2. (a) Evaluate whether the ISMB 200 section is plastic, compost, semicompact N section. (4)
- (b) Draw an eccentric bolted connection joining ISMB 225 and plate of 6 mm thick. The connecting planes are parallel. (3)
- (c) Explain two fire protection techniques in steel structures. (4)
- (d) What is fire rating? Explain mechanical properties of steel at elevated temperature. (4)
3. (a) A tie member of a roof truss consists of 2 ISMC 225 sections connected to both sides of a gusset plate 10mm thick. The pull on the joint is 380kN. Design the welded connection. If the overlap is limited to 125 mm., design the slotted connection. (4 + 4)
- (b) Write an comparative statement of bolted, riveted and welded connections, with their advantages and disadvantages. (4)
- (c) Draw a stiffened seated connection to join a vertical member (ISHB 300) to a beam (ISMB 300). (3)
4. (a) A tie member of a bracing system consists of 2 ISA 75mm \times 75mm \times 6mm sections connected to bath sides of a gusset plate 10 mm thick. (Fig 1). M 20, 4.6 bolts are used in the connection with pitch of 65mm and edge distance of 40mm. Determine the Tensile capacity of the member and the number of bolts required to develop will capacity of the member. Also determine the capacity of the joint if angles are connected to the same side of gusset plate. (5 + 3 + 5)



Connected to gusset
one on each side

Fig. 1

- (b) The maximum value of slenderness ratio carrying compressive loads resulting from and is 180. (2)

5. A column of ISHB 400 @ T14N/m has unsupported length of 4.00m. The column is effectively held in position but not restrained against rotation at both ends @ both axes. Calculate the axial load carrying capacity of the column.
6. Design a simply supported beam carrying factored dead load (including floor finish) of 11.5 kN/m and live load 5 kN/m. The beam has a clear span of 7.5 m. Assume any other data required. Answer should be accompanied by a suitable diagram. The Beam is restrained against torsion at both ends only. (13 + 2)
7. Design a single laced column with two channels back to back of length 8.0 m to carry an axial factored load of 1500 kN. The column may be assumed to have restrained in position but not in direction at both ends (hinged ends). Present the detailing also. (13 + 2)
8. (a) Design a typical slab base for a column ISHB 350@ 577N/m carrying an axial factored load of 1100 kN. M25 concrete is used for the foundation. Provide welded connection between column and the base shear. (12)
(b) Draw a typical gusseted base to support a column of ISHB 300. (not to be designed). (3)

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