

B. Tech. (Sem. V) (Main/Back) Examination, December - 2013
Civil Engg.
5CE3 Steel Structure - I

Time : 3 Hours]

[Total Marks : 80

[Min. Passing Marks : 24

Attempt any five questions. Selecting one question from each unit.
All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. I.S. 800-20072. Steel Tables or I.S. Hand Book of Struc. Engg.

UNIT - I

- 1 (a) Design a bolted joint for two plates of size $90 \text{ mm} \times 12 \text{ mm}$ and $90 \text{ mm} \times 16 \text{ mm}$, so as to transmit a factored load of 70 kN . Use bolts of grade 4.6 and Fe-410 for plates. 6
- (b) A 10 mm thick bracket is bolted to the flange of a column ISHB 300 @ 577 N/m , as shown in Fig 1. The factored load 200 kN is eccentric by 300 mm . Using M20 bolts of grade 4.6, design the connection.

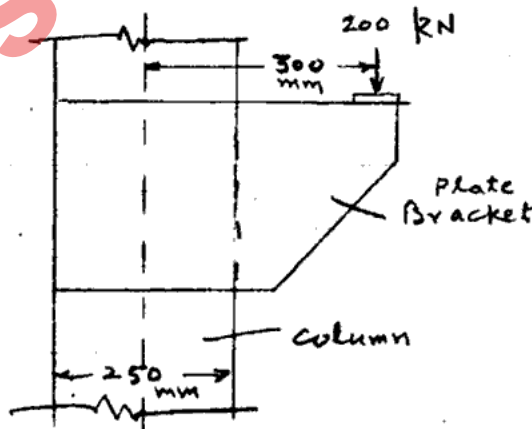


Fig 1

10

OR



- 1 (a) A tie member of a steel roof truss has section ISA $80 \times 80 \times 10$ mm. It is to be welded to a gusset plate 8 mm thick. Design the connection using only side welds to transfer an axial factored load of 150 kN.

6

- (b) Calculate the size of weld required to support a factored load of 120 kN applied at a distance of 150 mm from the edge of the flange of column, on a plate bracket as shown in Fig.2.

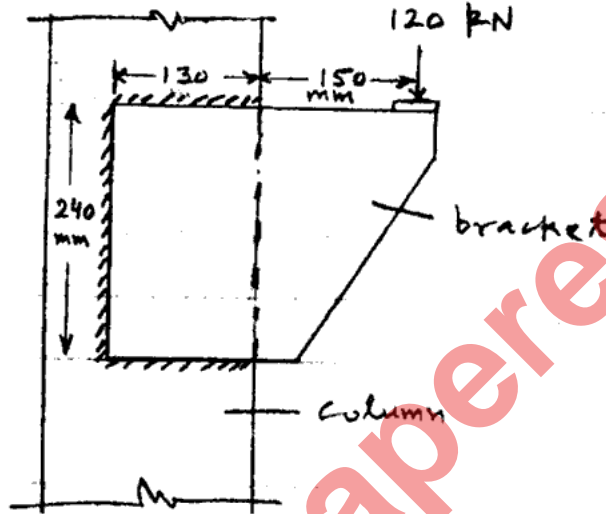


Fig. 2.

10

UNIT - II

- 2 (a) A discontinuous strut used in a truss has length 1.85 m between centres of connections. Design an equal angle section for this to carry a force of 100 kN.

6

- (b) A column used in a steel building has section ISHB 200 @ 37.32 kg/m with one cover plate of size 250 mm \times 12 mm attached to each flange. The column is 3.5 m long with one end fixed and other hinged. Determine the maximum factored load it can carry.

10

OR

- 2 Design a built up column, for an axial factored load of 1400 kN, if it is 4.5 m in height with both ends hinged. Use two channels placed back to back. Also design a single system of lacings for the column.

16



UNIT - III

- 3 A beam of effective span 6 m is simply supported at the ends. It is subjected to a uniformly distributed load (factored) of 30 kN/m, throughout the span. Design an I section for the beam if its compression flange is laterally supported. Apply checks for shear and deflection.

16

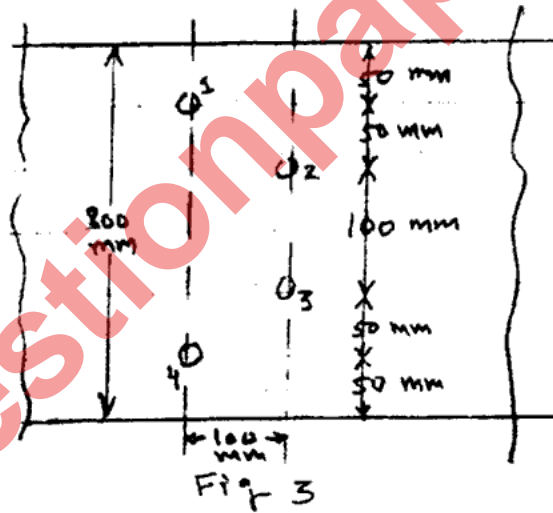
OR

- 3 Design a two tier grillage foundation for a column ISHB 350 @ 67.44 kg/m carrying a factored axial load of 1700 kN. The steel base plate under it measures 600 mm × 600 mm. Take safe bearing capacity of the soil as 170 kN/m².

16

UNIT - IV

- 4 (a) A plate section 300 mm × 12 mm has four staggered bolts of 20 mm dia. as shown in Fig. 3. Locate the critical section and find net area along it.



6

- (b) The main tie of a steel roof truss is subjected to a tensile force of 300 kN. Design the section by using two unequal angles. Use 18 mm bolts of grade 4.6.

10

OR

- 4 (a) Discuss the function of Column Bases. How gusseted base differs from slab base ?

6



- (b) Design a slab base for a column consisting of a single ISHB 300 @ 58.76 kg/m and carrying an axial factored load of 1500 kN. The column is supported on a concrete footing of mix M15.

10

UNIT - V

- 5 (a) Find shape factor of a triangular section.

6

- (b) A continuous beam ABCD is loaded as shown in Fig. 4. Taking load factor as 1.75, determine the value of M_p for which it may be designed as uniform section.

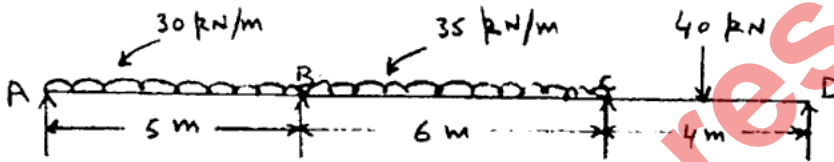


Fig 4

10

OR rtuonline.com

- 5 (a) What are three conditions which must be satisfied for a structure at collapse? Explain them.

6

- (b) Compute the value of true collapse load for the portal frame loaded as shown in Fig.5.

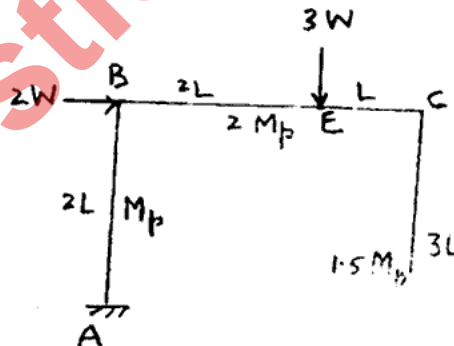


Fig 5

10

