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10CV72

Seventh Semester B.E. Degree Examination, Dec.2014/Jan.2015

Design of Steel Structures

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Use of IS 800-200 and steel tables permitted.
3. Assume missing data suitably.

PART – A

1 a. Mention the advantages and disadvantages of the steel structures. **(06 Marks)**

b. What are the requirements that govern the structural design of steel structures? **(06 Marks)**

c. Mention the different loads used in the steel sections and also the combination of loads. **(08 Marks)**

2 a. Explain various modes of failures of bolted connections with neat sketch. **(06 Marks)**

b. Two ISF sections 200 mm × 10 mm each and 1.5 m long are to be joined to make a member of length 3.0 m. Design a butt joint with the bolts arranged in a diamond pattern. The flats are supposed to carry a factored tensile force of 450 kN. Adopt HSFG bolts of property class 8.8, dia of bolt = 20 mm, coefficient of friction μ_f = 0.4, slip resistance designated at ultimate load. Also, determine the efficiency of the joint. **(14 Marks)**

3 a. A tie member of a roof truss consists of 2-ISA 125 × 75 × 10 mm. The tie member is subjected to pull of 250 kN. The angles are connected on either side of a gusset plate of 10 mm thick with long legs back to back. Design the end connection assuming field weld. **(06 Marks)**

b. For the welded bracket shown in Fig.Q3(b), determine the greatest safe load that can be applied at a distance of 120 mm from flanges of column. The size of weld is 6 mm. Assume shop weld.

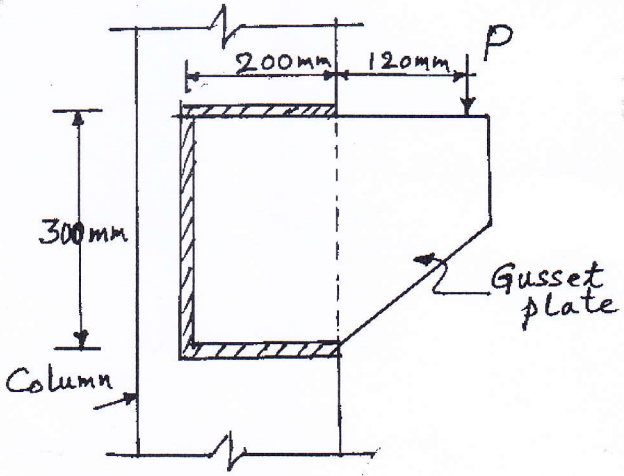

Fig.Q3(b) **(14 Marks)**

4 a. Determine the shape factor of a rectangular section of breadth 'b' and depth 'd'. **(06 Marks)**

b. Find out the collapse load for a propped cantilever subjected to a uniformly distributed load/unit length. The plastic capacity of the beam is M_p. **(14 Marks)**

PART – B

5 a. What is lug angle and why is it not preferred? Explain. **(06 Marks)**

b. Design an unequal single angle section to act as a tie member of length 1.56 m in a roof truss, if it is to carry an axial load of 60 kN, when subjected to possible reversal of stress into compression resulting from the action of wind or earthquake. Design welded connection. **(14 Marks)**

6 a. A column square in cross section (plan) of side 360 mm consists of 4 angles of ISA 80 × 80 × 10 mm at each corner with suitable lacing. Find the load carrying capacity of the column, if the height of the column is 5 m and effectively held in position at both ends, but not restrained against rotation. **(06 Marks)**

b. Design a single angle strut for a roof truss carrying a compressive load of 100 kN. The length of strut between c/c intersections is 210 cm. Also design bolted end connection with 4.6 grade bolt. **(14 Marks)**

7 a. Distinguish between the slab base and gusseted base and draw a neat sketch of sectional elevation of gusseted base indicating the salient features. **(06 Marks)**

b. A built up column consists of ISHB 350 @ 674 N/m with 400 × 20 mm flange plates carries an axial load of 1800 kN. Design a suitable gusseted base. Bearing strength of concrete is 0.45 fck. Assume M_{25} grade concrete and M_{20} bolts of grade 5.6. SBC of soil = 180 kN/m^2. **(14 Marks)**

8 a. Distinguish between laterally restrained and unrestrained beams with the help of sketches. **(06 Marks)**

b. A roof of a hall measuring 5 × 12 m consists of 120 mm thick RCC slab supported on steel I-section spaced at 3.0 m c/c. Take live load 3.5 kN/m^2 and finishes 1.5 kN/m^2. Bearing of wall = 400 mm. the beam is laterally restrained. Design one of the interior beam supporting the roof. Check for shear, moment capacity and deflection. **(14 Marks)**

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