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10CV72

Seventh Semester B.E. Degree Examination, Aug./Sept.2020

Design of Steel Structures

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.
2. Use of IS:800-2007 and SP(6)1 or Steel tables can be used.

PART - A

- 1 a. List any four advantages and two disadvantages of steel structures. (06 Marks)
b. What is Limit State? What are the limit states considered by the code? (08 Marks)
c. Define compound section and Built-up section. List the criteria governing choice of steel section. (06 Marks)
- 2 a. With a neat sketch briefly explain the block shear failure of bolt connected joints. (05 Marks)
b. Design the bolted bracket connection to support a reaction of 150 kN(factored). The eccentricity of the reaction is 100mm. A 10mm thick bracket plate is connected to ISHB150@300.19 N/m. Use 20mm diameter bolts of grade 4.6. Assume thread in shear plane. Take: $t_f = 9\text{mm}$ for column section. Check for the safety of the connection. (15 Marks)
- 3 a. List any 4 advantages and any 2 disadvantages of welding. (06 Marks)
b. List the common weld defects. (04 Marks)
c. A tie member consisting of an ISA 80×50×8 mm (Fe 410 grade steel) is welded to a 12mm thick gusset plate at site. Design weld to transmit load equal to the design strength of the member. Assume normal fillet weld. (10 Marks)
- 4 a. Define : (i) Plastic hinge (ii) Plastic modulus (iii) Shape factor (iv) Plastic collapse. (08 Marks)
b. Find the collapse load of the beam of uniform cross-section shown in Fig.Q4(b).

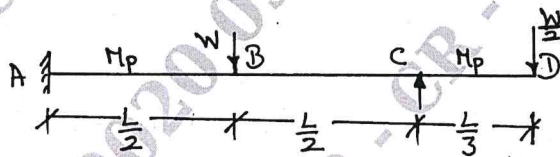


Fig.Q4(b)

(12 Marks)

PART - B

- 5 A single unequal angle ISA 100×75×6 is connected to 10mm thick gusset plate with six 16mm diameter bolts to transfer tension. Determine the design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance 40mm each. Also determine the efficiency of the joint. (20 Marks)
- 6 a. Design a column to support a factored load of 1050 kN. The column has an effective length of 7.0m with respect to z-axis and 5.0m with respect to y-axis. Use steel of grade Fe 410. (08 Marks)
b. Design a single angle discontinuous street to carry a factored axial compressive load of 65 kN. The length of street is 3.0 m between intersections. It is connected to 12mm thick gusset plate by 20mm diameter 4.6 grade bolts. Use steel of grade Fe410. Assume : $K_b = 1.0$, fixed ends. (12 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 7 A column ISHB 350@661.2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Use 24mm diameter bolts of grade 4.6. Take: $K_b = 0.541$. (20 Marks)
- 8 A simply supported steel joint of 4m effective span is laterally supported throughout. It carries a factored u.d.l of 15 kN/m (inclusive of self weight). Design the section using Fe410 grade steel. (20 Marks)
