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10CV72

Seventh Semester B.E. Degree Examination, July/August 2022
Design of Steel Structures

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
 2. Use of IS800-2007 and structural steel hand book are permitted.
 3. Assume any missing data suitably.

PART – A

- State different load and load combinations for the design of structures. (06 Marks)
 - State the merits and demerits of steel as a structural material. (07 Marks)
 - Explain what is structural steel. List out the important properties of such steel. (07 Marks)
- Name the various modes of failure of bolted connections with neat sketches. (06 Marks)
 - Design the bracket connection to carry a bracket load of 120 kN at an eccentricity of 175 mm. Use M20 bolts with property class 4.6. The thickness of gusset plate is 10 mm. (14 Marks)
- Explain briefly common defects in the welds. (08 Marks)
 - Determine the maximum load that can be resisted by the bracket shown in Fig. Q3 (b) by fillet weld of size 6 mm and shop welded. Take $f_u = 410 \text{ N/mm}^2$. (12 Marks)

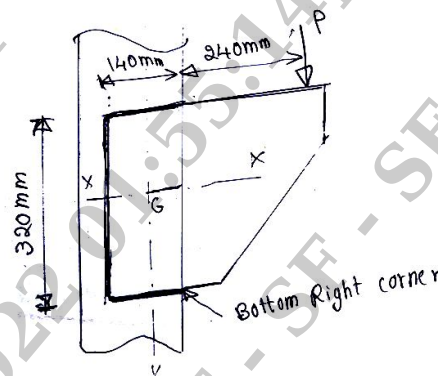


Fig. Q3 (b)

- Explain briefly the theorems of plastic analysis. (06 Marks)
 - Determine the shape factor for a Tee section of flange width 100 mm and thickness 10 mm and web of depth 150 mm and thickness 10 mm. (06 Marks)
 - Find out the collapse load for a continuous beam shown in Fig. Q4 (c). The beam is of uniform cross section. Draw plastic moment diagram. (08 Marks)

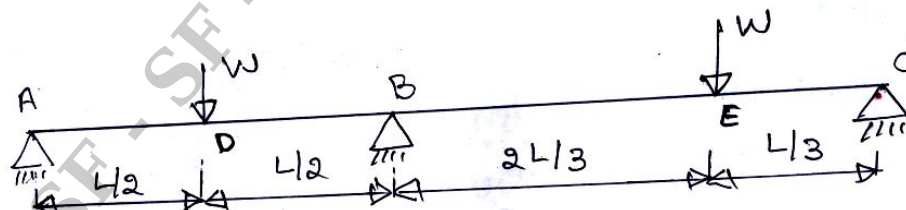


Fig. Q4 (c)

(08 Marks)

PART – B

- 5 a. Explain different modes of failure of tension members. (06 Marks)
- b. A tension member ISLB 250@273.7 N/m is connected with 2 plates 175 mm wide and 10 mm thick with 2 lines of 16 mm diameter bolts in each flange. The end connections are as shown in Fig. Q5 (b). Determine
- The design tensile strength of ISLB section used.
 - The design tensile force which the plates can transfer.
- Use Fe410 grade of steel.

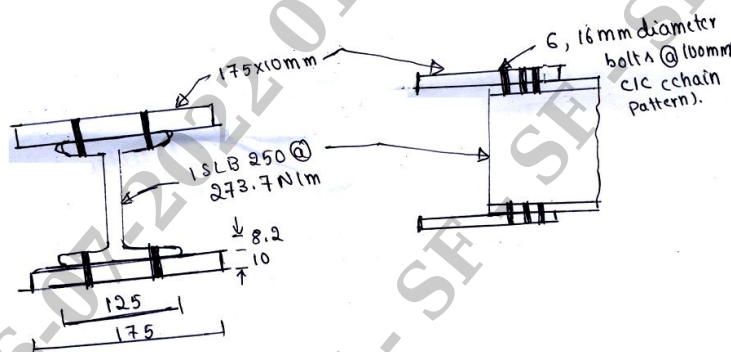


Fig. Q5 (b)

(14 Marks)

- 6 Design a built up column with four angles. The column is 12 m long and supports a factored axial compressive load of 700 kN. The ends of the column are held in position and restrained against rotation. Design a suitable double lacing system also. Use steel of grade Fe410. (20 Marks)
- 7 Design a gusseted base for a column ISHB 200 at 40 kg/m along with cover plates 250mm×12mm on either side subjected to a load of 2500 KN (factored load). Use M20 concrete and SBC 220 KN/m². Design both gusseted base and concrete base. Use M18 HSFG bolts of class 8.8. (20 Marks)
- 8 a. Write short notes on web buckling and web crippling. (06 Marks)
- b. Design a suitable beam for a roof of dimension 7.5m×12m . It consists of 100 mm thick RC slab supported on steel beams spaced at 3 m C/C. The finishing may be taken as 1 KN/m² and the live load is 4 KN/m². The self weight of beam is assumed as 1 KN/m. Take limiting deflection as $\frac{\text{span}}{250}$. (14 Marks)
