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17CT72

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Design of Steel Structures

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 800-2007 and steel tables are allowed.*

Module-1

- 1 a. What are rolled steel sections? List and explain different types of rolled steel sections with a neat sketch. (10 Marks)
- b. Determine the bolt value for the shown butt joint in Fig.Q1(b) using M₂₀ and property class 5.6 bolts.

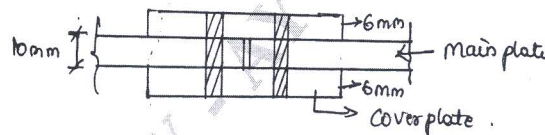


Fig.Q1(b)

(10 Marks)

OR

- 2 a. What are bolted connections? Give the advantages and disadvantages of bolted connections. (10 Marks)
- b. Determine the efficiency of lap joint shown in Fig.Q2(b). Use M₁₆ bolt and class 5.6 Fe 410 plate is used. (10 Marks)

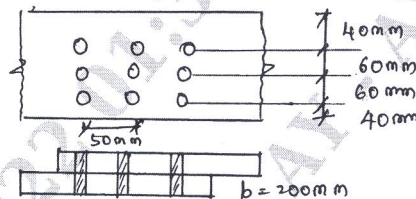


Fig.Q2(b)

Module-2

- 3 a. What is welding? Explain briefly the welding defects with a neat figure. (12 Marks)
- b. Design a welded end connection for a tension member as shown in Fig.Q3(b), consisting of ISMC 300 to carry a load equal to full strength of the member, the length of the joint is limited to 250 mm. (08 Marks)

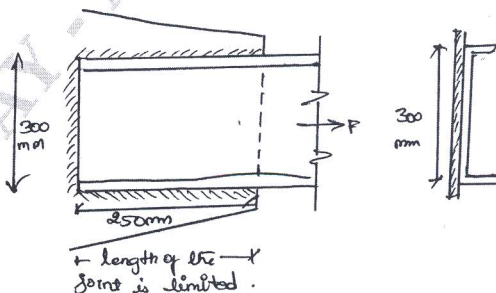


Fig.Q3(b)

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.

OR

- 4 a. What are the types and properties of welds? Explain with a neat figure. (10 Marks)
 b. Determine the size of the weld required the shown bracket connection for Fig.Q4(b).

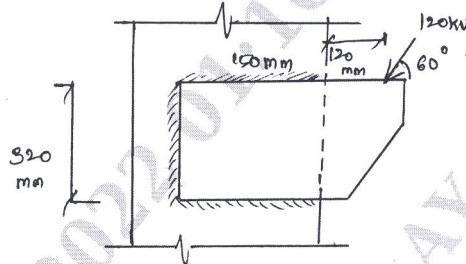


Fig.Q4(b)

(10 Marks)

Module-3

- 5 a. Explain : (i) Theorem of plastic collapse
 (ii) Plastic collapse load
 (iii) Conditions of plastic analysis (06 Marks)
 b. Two plates of 6 mm thick are connected by "single bolted lap joint" with 20 mm dia bolts at 60 mm pitch. Calculate the efficiency of a joint, take 410 N/mm² and 4.6 grade bolt for the Fig.Q5(b). (14 Marks)

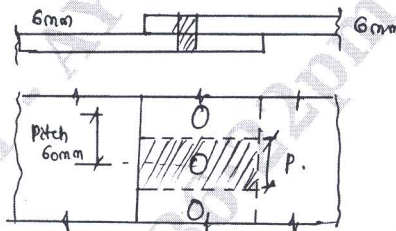


Fig.Q5(b)

OR

- 6 Explain :- (i) Lug angles
 (ii) Splices
 (iii) Gusset plates
 (iv) Factors effecting the strength of tension members (20 Marks)

Module-4

- 7 a. Determine the compressive strength of angle strut ISA 100×65×8 mm with a length 3m when connected by (i) with single bolt (ii) More than two bolts (iii) Welded connection. Take $f_y = 250$ MPa. (10 Marks)
 b. Design a angle strut using double angle to carry a load 400 kN. Use welded connection. Take the length of the members as 2m. (10 Marks)

OR

- 8 a. Design a angle strut using single angle section to carry a load of 150 kN. Use M₂₀ property class 5.6 bolts. The length of the member is 2.5m. (10 Marks)
 b. Determine compressive strength of double angle strut 2ISA 90×60×8 mm connected to gusset plate. (i) On same side (ii) On both sides. The thickness of gusset plate is 10mm and length is 2.5 mtrs. (10 Marks)

Module-5

- 9 a. Explain (i) Lateral stability of beams (ii) Factors affecting lateral stability (06 Marks)
b. A simply supported beam ISMB 350 @52.4 kg/m is used over a span of 5m. The beam carries an udl, live load 20 kN/m and DL 15 kN/m. The beam is laterally supported throughout. Check the safety of the beam. (14 Marks)

OR

- 10 a. What is slab and gusseted base? (05 Marks)
b. A compression member ISHB 300 at 63 kg/m is carrying a load of 800 kN. Take M_{20} grade of concrete and 150 kN/m^2 as SBC of soil. Design slab base and concrete base using welded or bolted connection. (15 Marks)
