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18CV61

Sixth Semester B.E. Degree Examination, June/July 2024
Design of Steel Structural Elements

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, SP – 6 – I or steel table is permitted.*

Module-1

1 a. What are the advantages and disadvantages of steel structures?   **(10 Marks)**
   b. Identify plastic hinge 't' is 0-414ℓ from simple support of propped cantilever beam supporting a UDL of W kN/m over the entire span.   **(10 Marks)**

OR

2 a. What are rolled steel sections? Mention any six shapes used as a structural elements with sketches.   **(08 Marks)**
   b. Analyze the continuous beam ABC shown in Fig Q2(b) and calculate maximum plastic moment. Consider load factor as 1.5.
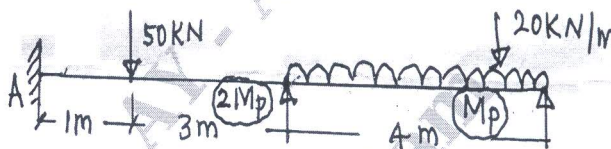

Fig Q2(b)   **(12 Marks)**

Module-2

3 a. Define : i) Pitch of bolt ii) Gauge distance   iii) Edge distance   iv) Staggered distance.
                    (08 Marks)
   b. Determine the bolt valve used in a lap joint connecting two plates of thickness 10mm and 8mm. Use M16 bolts with property class 4-6 and strength of plate $410N/mm^2$. Assume e = 30mm, p = 50mm and partially threaded bolts are used.   **(12 Marks)**

OR

4 a. What are the advantages and disadvantages of welded connections?   **(12 Marks)**
   b. Two plates of 16mm and 14mm are to be joined by a butt weld and joint is subjected to factored tensile force of 430kN. Due to some reasons effective length of weld that to be provided is 175mm. Check the safety of the joint for the following cases.
      i) Single V – Butt weld
      ii) Double V – Butt weld   **(08 Marks)**

Module-3

5 a. Explain Laced and Battened columns with sketches.   **(08 Marks)**
   b. Design a column section using single rolled steel beam along with cover plates to carry of factored load of 2000kN. Column both ends are fixed with following data :
      Section : ISHB150@ 30.6Kg/m
      Cover plates : 250mm × 20mm
      Take ℓ = 6m.   **(12 Marks)**

OR

6   Design a compression member using double channel section (2ISLC 300@33-1Kg/m) face to face to carry factored load of 1600kN. The length of the column is 5m with one end fixed and one end hinged. Assume M18 bolts and f_{cd} = 200N/mm². Also design single facing system.   **(20 Marks)**

Module-4

7   a. Briefly explain Gussetted base with sketches.   **(06 Marks)**
     b. Determine the tensile strength of a tie member ISA 100 × 75 × 8mm connected to Gusset plate using 4 bolts in a row of 16mm diameter at a pitch of 60mm and edge distance of 40mm. Take f_y= 250N/mm², f_u = 410N/mm² and C = 60.   **(14 Marks)**

OR

8   a. What is lug angle? Explain briefly with sketch.   **(06 Marks)**
     b. Design a slab base for a column ISHB 300@58.8Kg/m subjected to ultimate load of 2250kN. The grade of concrete for pedestal is M_{20} and SBC of soil is 180kN/m². Design slab base and concrete base.   **(14 Marks)**

Module-5

9   Design a beam of effective span 6m subjected to UDL of 10kN/m along with 100kN point load. The beam and laterally supported. Thickness of wall is 230mm. Assume self weight of bam as 1kN/m.   **(20 Marks)**

OR

10   Simply supported beam ISMB350@52.4Kg/m is used over a span of 5m. The beam carries an UDL live load of 20kN/m and dead load is 15kN/m. The beam is laterally supported throughout check the safety of the beam.   **(20 Marks)**

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