CBCS SCHEME

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18CV61

Sixth Semester B.E. Degree Examination, Dec.2024/Jan.2025
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 code book, steel tables are permitted.

Module-1

1 a. What are the advantages and disadvantages of using steel structures? **(06 Marks)**

b. Explain different types of limit states. **(06 Marks)**

c. Explain various types of loads and load combinations to be used in design of steel structures. **(08 Marks)**

OR

2 a. Find the shape factor and plastic moment capacity for the section shown in the below Fig.Q2(a).

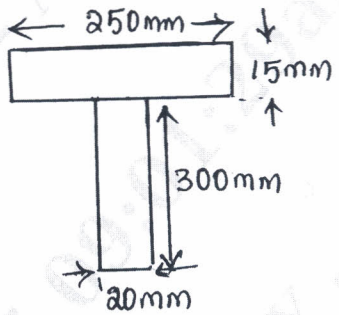

Fig.Q2(a) **(08 Marks)**

b. Explain the following :
i) Plastic hinge
ii) Collapse Mechanism **(04 Marks)**

c. Compute plastic moment capacity required for continuous beam shown in Fig.Q2(c). Take load factor as 1.5. Assume M_p constant for all span.

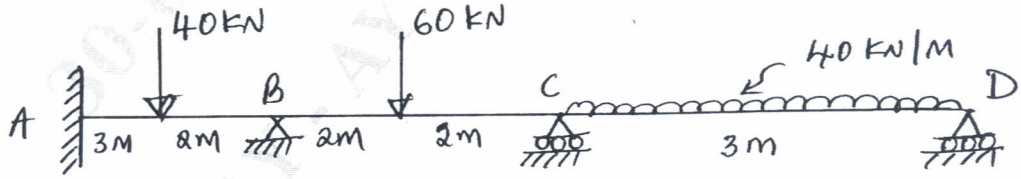

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. What are the advantages and disadvantages of bolted connection? **(06 Marks)**

b. Find the efficiency of the lap joint shown in the Fig.Q3(b). Given M_{20} bolts of 4.6 grade, Fe_{410} plates are used.

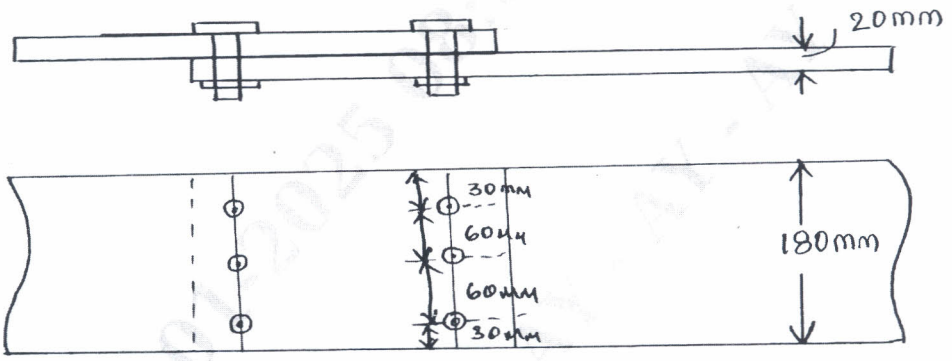

Fig.Q3(b) **(14 Marks)**

OR

4 a. What are the advantages of welded connection? Also mention the disadvantages of welded connection. **(06 Marks)**

b. Determine the minimum load that can be resisted by the bracket shown in the Fig.Q4(b) by filled weld of size 6 mm for shop weld.

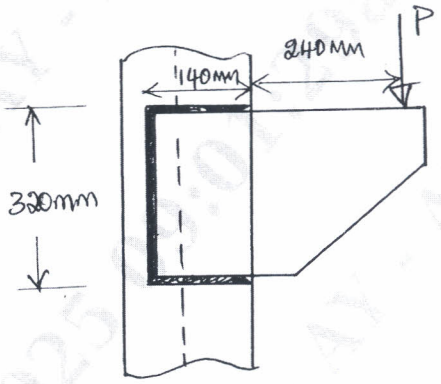

Fig.Q4(b) **(14 Marks)**

Module-3

5 a. Explain modes of failure of compression members. **(06 Marks)**

b. Design a double angle strut to carry an axial factored load of 240 kN. The axial length of strut is 3m. Bolted connections are to be used to connect it to 12 mm gusset plate. Draw the connection details. **(06 Marks)**

c. Design a compression member using double channel section to carry a load of 1500 kN. The height of the column is 6 m and both ends are fixed. Channels are arranged back to back. **(08 Marks)**

OR

6 Design a built up column using a pair of I-section placed at a suitable spacing to support a load of 1600 kN. Height of the column is 7 m with both ends of the column restrained in position and direction. Also design a suitable lacing system to the built up column. Also draw the plan and elevation. **(20 Marks)**

Module-4

7 a. Explain various design strength of tension members with neat sketch. **(08 Marks)**

b. Design a tension member using single angle section to carry a load of 200 kN (working). Also design suitable bolted connection using M_{20} property class 4.6 black bolts. Also check for slenderness ratio when member is subjected to reversal of stresses due to wind load. Take length = 2.5 m. **(12 Marks)**

OR

8 a. A diagonal member of a roof truss carries a pull of 300 kN. Design the section and its connections with a 16mm thick gusset plate. The length of the connection is limited to 340 mm. Design the lug angles also. Take Fe410 grade steel and bolts of grade 4.6 are to be used. **(10 Marks)**

b. Design a slab base for a column ISHB@577 N/M carrying an axial factored load of 1000 kN. M_{20} concrete is used for the foundation. Provide welded connection between column and base plate. **(10 Marks)**

Module-5

9 a. What do you mean by web buckling and web crippling? **(06 Marks)**

b. Design a simply supported beam of 7 m span carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. Take uniformly distributed load on the beam as 100 kN and self weight and imposed load as 150 kN. In addition the beam carries a point load of 100 kN (50 kN DL + 50 kN LL) at mid span. (Assume a stiff bearing length 75 mm) **(14 Marks)**

OR

10 A roof of a hall measuring (8 × 12)m consisting of 100 mm thick RCC slab supported on steel I-beam spaced 3 m c/c. The finished load may be taken as 1.5 kN/m^2 and LL of 1.5 kN/m^2. Design the steel beam. **(20 Marks)**

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