CBCS SCHEME

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18CV61

Sixth Semester B.E. Degree Examination, June/July 2023
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. Assume any missing data.
3. Use of IS:800-2007 and steel tables are permitted.

Module-1

1 a. Mention the failure criteria of steel with examples. Explain any one in brief. **(10 Marks)**

b. What are the advantages and disadvantages of using steel structures? Mention different types of RS sections using construction. **(10 Marks)**

OR

2 a. Define shape factor and determine the plastic and section modulus of a built up section as shown in Fig.Q2(a).

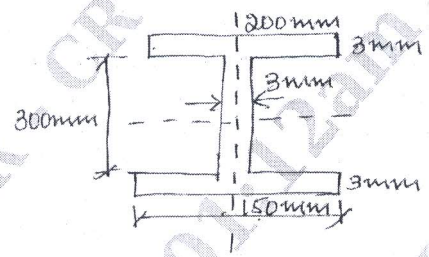

Fig.Q2(a) **(10 Marks)**

b. Determine the plastic moment capacity for the beam loaded as shown in Fig.Q2(b).

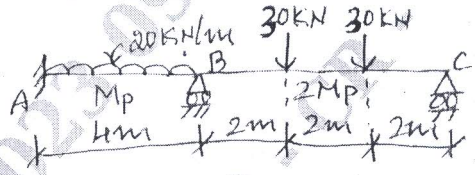

Fig.Q2(b) **(10 Marks)**

Module-2

3 a. Mention any four advantages and disadvantages of HSFG bolts and also explain various modes of failure of bolted connection. **(08 Marks)**

b. Design a bolted connection between the flange of a column ISHB450@907 N/m and a bracket plate 15 mm thick. The bracket plate is supporting a load of 150 kN at an eccentricity of 350 mm. Adopt HSFG bolts of property class 8.8 . **(12 Marks)**

OR

4 a. Mention any four advantages and disadvantages of welding. Explain common defects in welding with neat sketch. **(10 Marks)**

b. Determine the size and effective length of the side fillets to connect two plates with cross sections of 150×10mm and 100×10mm subjected to a tension of 150 kN (Working load). **(10 Marks)**

Module-3

5 a. Explain the possible modes of failure of axially loaded columns. **(04 Marks)**

b. Design the member consists of a single angle to carry a tensile force of 200 kN. The length of tension member is 3.5m and subjected to reversal stresses due to wind forces. If the yield strength and the ultimate strength of the steel used are 250 MPa and 410 MPa and use M_{18} grade bolt. **(16 Marks)**

OR

6 a. Define Lacing and batten system with neat sketch. **(03 Marks)**

b. Design a laced column with two channels back to back of length 8m to carry an axial factored load of 1000 kN. The column is hinged at both ends. **(17 Marks)**

Module-4

7 a. Define Lug angle. Where lug angles are provided? **(03 Marks)**

b. Design the end connection for ISA 100×100×10 mm using lug angle for its full design strength. Use M_{20} bolts, property class 4.6. Provide yield stress of steel 250 MPa. Sketch the connection details. **(17 Marks)**

OR

8 a. Explain the types of column bases. **(04 Marks)**

b. Design a slab base for an ISHB350@661.2 N/m column to carry a factored load of 1000 kN. M_{25} concrete and Fe415 grade steel is used for the foundation. **(16 Marks)**

Module-5

9 a. What are the factors which affects lateral stability? **(03 Marks)**

b. Design a cantilever beam which is built into concrete wall and carrying a load of 25 kN/m and live load of 10 kN/m. The span of beam is 5m. **(17 Marks)**

OR

10 a. Explain briefly
i) Laterally Unsupported beams
ii) Column splices **(06 Marks)**

b. Design a simply supported I section to support the slab of a hall of 9m × 24m with beams spaced at 3m c/c. Slab is of 100mm thick. Consider floor finish load of 0.5 kN/m^2 and live load of 3 kN/m^2. Use F_y = 250 MPa steel. Assume adequate lateral support to the compression flange. Also check for deflection. **(14 Marks)**

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