CBCS SCHEME

18CV61

Sixth Semester B.E. Degree Examination, Jan./Feb. 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. Use of IS800-2007, and steel tables are permitted.
3. Missing data, if any, may be suitably assumed.

Module-1

1   a.   Explain the advantages and disadvantages of steel structures.   **(08 Marks)**
    b.   Distinguish between working stress method and limit state method of design.   **(06 Marks)**
    c.   Determine the shape factor for a triangle of base width 'b' and height 'h'.   **(06 Marks)**

OR

2   a.   Explain different types of loads and load combinations to be considered in the design of steel structures.   **(05 Marks)**
    b.   Compute the plastic moment capacity for a continuous beam shown in the Fig.Q.2(b) by kinematic method, take load factor as 1.5.   **(10 Marks)**
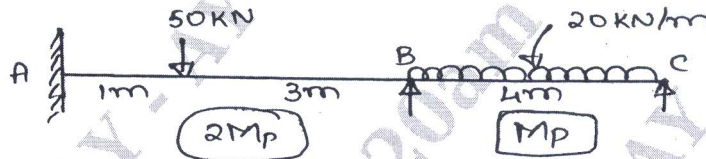

Fig.Q.2(b)

    c.   Explain the terms:
      i)   Plastic Hinge
      ii)   Shape factor
      iii)   Plastic moment.   **(05 Marks)**

Module-2

3   a.   Mention any four advantages and disadvantages of HSFG bolts.   **(04 Marks)**
    b.   Explain with neat sketch of various modes of failure of bolts connection.   **(06 Marks)**
    c.   Determine the efficiency of the lap joint shown in Fig.Q.3(c). Use M16; property class 5.6 bolts. The grade of plate is 410N/mm². Assume any shank in shear plane.   **(10 Marks)**
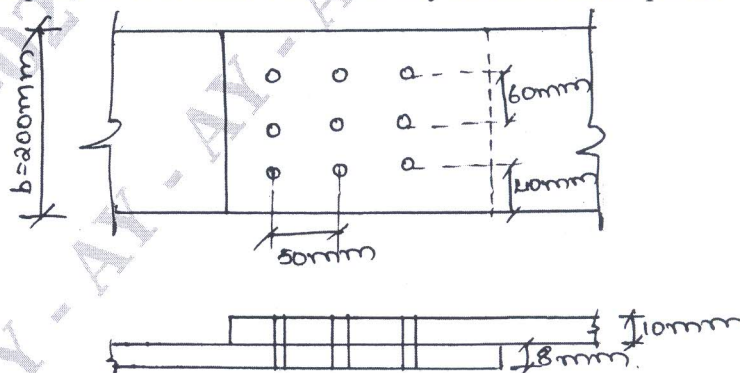

Fig.Q.3(c)

OR

4   a. List the type of welded joint with sketches. (04 Marks)
    b. What are the common defects in welding? Explain briefly with neat sketch. (06 Marks)
    c. A bracket plate is used to transfer the reaction of a beam to a column flange as shown in Fig.Q.4(c). The bracket plate is connected to the column flange by a 6mm fillet weld. Compute the maximum load that can be placed over the bracket plates at a distance of 75mm from the flange of the column section. (10 Marks)
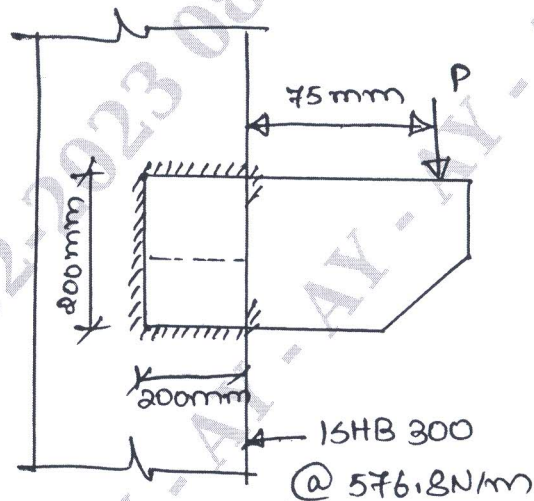

Fig.Q.4(c)

Module-3

5   a. Explain the behavior of compression member. (06 Marks)
    b. A rolled steel beam ISHB 300@ 58.8kg/m is used as a column. The column is fixed in position but not in direction at both ends. Determine the safe load carrying capacity in the section if the length of the column is 4.5m. (14 Marks)

OR

6   Design a column section using double channels back to back to carry a factored axial load of 1080kN, height of column is 10m. Column is restrained in position but not in direction at both ends. Provide single lacing system with bolted connection. Assume steel of grade Fe410 and bolts of grade 4.6. (20 Marks)

Module-4

7   a. What are Lug angles? Explain in brief with a neat sketch. (05 Marks)
    b. Design a slab base for a column ISHB 350 @ 710.2N/m subjected to a factored axial compressive load of 1500kN. Load is transferred to the base plate by direct bearing of column flanges. The base rests on concrete pedestal of grade M20.SBC of soil is 200kN/m². (15 Marks)

OR

8   A single unequal angle 100 × 75 × 8mm is connected to a 12mm thick gusset plate at the ends with the 6 no's of 20mm diameter bolts to transfer tension as shown in the Fig.Q.8. Determine the design tensile strength of the angle if the gusset is connected to 100mm µg. The yield strength ultimate strength of the steel used are 250MPa and 400MPa. The diameter of the bolts used is 20mm.   **(20 Marks)**
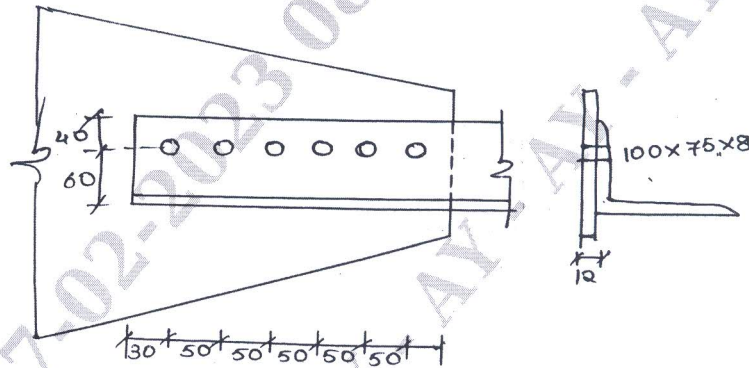

Fig.Q.8

Module-5

9   a. What is web buckling and web crippling?   **(04 Marks)**
     b. Briefly explain different types of seated connections.   **(06 Marks)**
     c. List the various factors affecting the lateral stability of a beam.   **(06 Marks)**
     d. Write a note on laterally unsupported beam.   **(04 Marks)**

OR

10   A room of hall measuring 6m × 13.7m consists of 120mm thick RCC slab supported on steel I section spaced at 3.5m centre to centre. The hall is having wall of 30cm thickness all around. The finishing load on the roof is 1kN/m² and L.L = 2kN/m². Design the steel beam and apply all the necessary checks and design.   **(20 Marks)**

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