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15CV62

Sixth Semester B.E. Degree Examination, June/July 2019
Design of Steel Structural Elements

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a.   What are the advantages and disadvantages of using steel structure?   **(05 marks)**
    b.   Explain briefly limit state method of design of structure. Mention the limit states.   **(05 marks)**
    c.   What are rolled used steel sections? Mention different types of RS sections used in constructions.   **(06 Marks)**

OR

2   a.   Explain the terms : i) plastic hinge   ii) collapse mechanism.   **(03 marks)**
    b.   Find the shape factor and plastic moment capacity for a built up beam section shown in fig.Q2(b).   **(05 Marks)**

Fig.Q2(b)

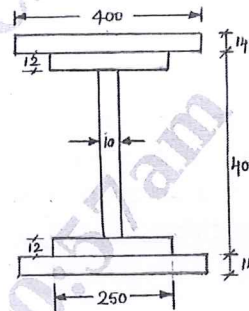   c.   Determine the plastic moment capacity (Mp) for the beam loaded as shown in Fig. Q2(c). Use load factor = 1.50.
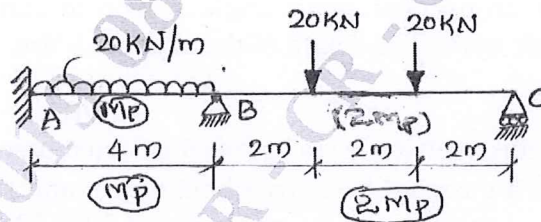

Fig.Q2(c)   **(08 Marks)**

Module-2

3   a.   Explain various modes of failure of bolted connections.   **(06 Marks)**
    b.   Mention any four advantages and disadvantages of HSFG Bolts.   **(04 Marks)**
    c.   An ISA 100mm × 100mm ×10mm carries a load of 100kN. It is to be joined with a 12mm thick gusset plate. Design the joint using HSFG bolts of 16mm diameter and grade 8.8, when i) no slip is permitted ii) slip is permitted. Steel is of grade Fe410.   **(06 Marks)**

OR

4   a.   What are common defects in welding? Explain briefly with neat sketches.   **(06 Marks)**
    b.   A tie member of roof truss consists of 2 ISA 100 × 75× 8mm and are connected to both the sides of 10mm gusset plate, by longer legs. Factored axial force in the member is 500kN. Design the welded joint by providing weld i) along two parallel sides of angle ii) along all 3 sides of connected angle. Assume shop weld.   **(10 Marks)**

Module-3

5 a. Explain the possible modes of failure of axially loaded columns. **(03 Marks)**

   b. A double angle discontinuous strut ISA 150 × 75 × 10mm, long leg back to back is connected to either side of 10mm gusset plate by 2 bolts in a row. The length of strut between point of intersection is 3.5m and are tack bolted all along the length. Determine the safe load that the strut can carry. **(05 Marks)**

   c. A built up column consists of ISMB 250@ 366N/m with two side plates 250mm × 10mm as shown in Fig.Q5(c). Compute the maximum compressive load that the column can carry, if the length of the column is 6.25m ends of columns are restrained in position at both the ends, and one end is restrained against rotation. **(08 Marks)**
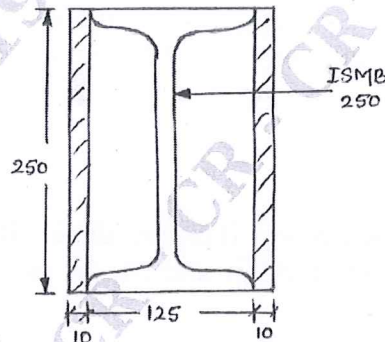

Fig.Q5(c)

OR

6 Design a built up column comprising of two channel section placed back to back to carry a load of 1000 kN over a length of 10m. The ends of compression member are restrained in position but not in direction/rotation. Design single lacing system also with 20mm diameter bolts for connections. **(16 Marks)**

Module-4

7 a. What are lug angles? Briefly explain advantages and disadvantages of using lug angles in bolted connections. **(06 Marks)**

   b. Design an unequal single angle section to carry a load of 140 kN in tension. Use M20, 4.6grade bolts. The length of the member is 3m. **(10 Marks)**

OR

8 a. Distinguish between slab base and gusseted base. **(03 Marks)**

   b. Design a gusseted base for a built up column ISHB 350@ 674 N/m with 400mm × 20mm flange plates carrying an axial load of 2000 kN. Assume M_{20} grade concrete and M_{24} bolts of grade 4.6. SBC = 200 kN/M². **(13 Marks)**

Module-5

9 a. Briefly explain the factors affecting lateral stability of beams. **(04 Marks)**

   b. Design one of the internal beams of span 6m (clear), spaced in the hall at 3.5m c/c, supports 130mm thick RCC slab. Take imposed load of 5kN/m² and finishes 1.5 kN/m². Bearing of wall 300mm. The beam is laterally restrained. Check for shear, moment capacity and deflection. **(12 Marks)**

OR

10 a. Write a note on Laterally unsupported beam. **(04 Marks)**

    b. Briefly explain different types of seated connections. **(05 Marks)**

    c. Explain the necessities of providing column splices. With neat sketches write about any two types of column splices. **(07 Marks)**