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21CV63

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

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, Handbook SPC(Part-1), 1964 is permitted.

Module-1

1 a. Describe briefly advantages and disadvantages of steel structures. **(06 Marks)**
   b. State the upper bound, lower bound and uniqueness theorems. **(06 Marks)**
   c. Explain the four classes of section as per IS 800:2007. **(08 Marks)**

OR

2 a. Explain the load combinations adopted in the design of steel structures. **(06 Marks)**
   b. Determine the shape factor of a 'T' section having a flange width 100 mm and 10 mm thick with a web of 10 mm thick and 150 mm depth. **(08 Marks)**
   c. Define : (i) Plastic hinge   (ii) Mechanism   (iii) Load factor **(06 Marks)**

Module-2

3 a. Explain the various modes of failure of bolted connections with neat sketches. **(06 Marks)**
   b. Describe briefly advantages and disadvantages of welded connections. **(06 Marks)**
   c. A tie member in a truss girder is 250mm ×14mm in size. It is welded to a 10 mm thick gusset plate by a fillet weld. The overlap of the member is 300 mm and the weld size is 6 mm. Determine the design strength of the joint, if the welding is done as shown in Fig. Q3 (c). What is the increase in strength of the joint, if welding is done allround. Assume shop welding. **(08 Marks)**
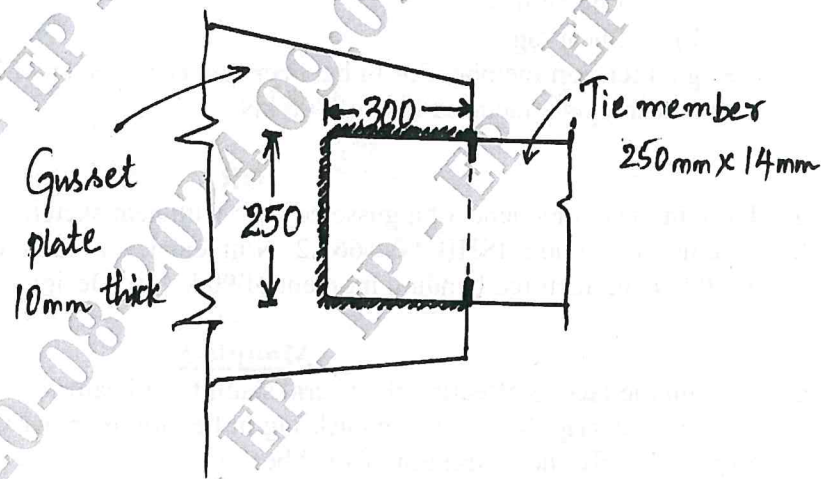

Fig. Q3 (c)

OR

4 a. What are the requirements of an ideal welded joint? **(06 Marks)**

b. Determine the safe load 'P' that can be carried by the joint shown in Fig.4 (b). The bolts used are 20 mm diameter of grade 4.6. The thickness of the flange of I-section is 9.1 mm and that of bracket plate 10 mm. **(14 Marks)**
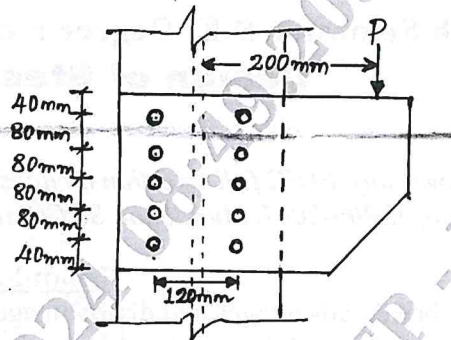

Fig. Q4 (b)

Module-3

5 a. Explain the factors affecting strength of a column. **(06 Marks)**
  b. A column 5 m long has to support a factored load of 5000 kN. It is effectively held in position and direction at both ends. Design the column using ISHB400@0.806 kN/m and 20 mm cover plates. (Both the ends are fixed). **(14 Marks)**

OR

6 a. Mention design specifications for battened system as per IS800-2007. **(04 Marks)**
  b. Explain the different failure modes of compression members. **(06 Marks)**
  c. Design a rolled steel beam section column to carry an axial load of 1000 kN at service condition. The length of column is 4 m. Both ends are hinged. **(10 Marks)**

Module-4

7 a. Explain the following :
  (i) Lug angles.
  (ii) Shear lag. **(06 Marks)**
  b. Design a tension member 3.4 m between center to center of intersection using double angle section carrying a factored load of 700 kN. **(14 Marks)**

OR

8 a. Explain the components of a gusseted base with neat sketch. **(06 Marks)**
  b. A column section ISHB350@661.2 N/m carries a factored axial compressive load of 1650 kN and factored bending moment of 90 kN-m. Design the base plate. **(14 Marks)**

Module-5

9 a. Explain the factors affecting the lateral stability of beams. **(08 Marks)**
  b. Explain web crippling and web buckling in flexural member with sketches. **(06 Marks)**
  c. Explain briefly shear strength of steel beams. **(06 Marks)**

OR

10 a. Explain briefly lateral unsupported beams. **(04 Marks)**
  b. A simply supported steel joist of 4.0 m effective span is laterally supported throughout. It carries a total uniformly distributed load of 40 kN. (Inclusive of self weight). Design a suitable steel section of grade Fe410. **(16 Marks)**

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