Roll No. .....
Printed Pages : 3

8419

BT-4 / M–15

DESIGN OF STEEL STRUCTURES–I

Paper–CE–204–E

Time allowed : Three hours] *[Maximum marks : 100*

Note : Attempt five questions, selecting at least one question from each unit. Use of IS-800 and steel tables is allowed. Assume any missing data appropriately and mention the same clearly.

Unit–I

1. (a) Describe the modes of failure of riveted joints. 8

   (b) Figure 1 shows an eccentric welded connection with 6 mm fillet welds. Determine the greatest load 'P' per bracket plate which can be applied on the connection if the shear stress in the weld is not to exceed 108 MPa. 12

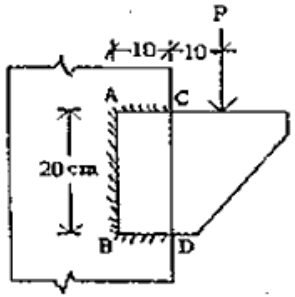

Fig. 1

2. (a) What are lug angles ? What specifications are to be followed for their design. 8

(b) Design an unequal angle section to act as a tie member 1.65 m long in a roof truss if it is to carry an axial load of 125 kN. Use hand driven rivets at joints. 12

Unit–II

3. (a) Differentiate between columns and built-up columns. 5

   (b) Design a slab base for a column ISHB 350 @ 72.4 kg/m, carrying an axial load of 1200 kN. Take allowable bearing pressure on concrete as 4 N/mm^2. 15

4. Design a built-up column carrying an axial load of 1250 kN. Its length is 8 m and it is effectively held in position at both ends and restrained against rotation at one end. Also, design the battens for the built-up column. Take $f_y = 250$ N/mm^2. 20

Unit–III

5. (a) Explain briefly the concept of web buckling. 5

   (b) A simply supported beam has an effective span of 6 m and carries a uniformly distributed load of 60 kN/m. Taking $f_y = 250$ N/mm^2 and $E = 2 \times 10^5$ N/mm^2, design the beam, if it is laterally supported. Apply necessary checks. 15

6. A beam simply supported over an effective span of 9 m, carries a uniformly distributed load of 65 kN/m, inclusive of its own weight. The depth of the beam is restricted to 500 mm. Design the beam, assuming that the compression flange

of the beam is laterally supported by floor construction. Take $f_y = 250$ N/mm^2 and $E = 2 \times 10^5$ N/mm^2. Assume width of support = 200 mm. 20

Unit–IV

7. Design a gantry girder for a mill building to carry an electric overhead travelling crane, having the following data :

Crane capacity = 255 kN

Weight of crane excluding crab = 200 kN

Weight of crab = 65 kN

Span of crane between rails = 20 m

Minimum hook approach = 1.1 m

Wheel base = 3.4 m

Span of gantry girder = 7 m

Mass of rail section = 30 kg/m

Height of rail section = 75 mm

Take $f_y = 250$ N/mm^2 and $E = 2 \times 10^5$ N/mm^2. 20

8. (a) Enumerate different types of stiffeners. Describe briefly. 5

   (b) Design the maximum section of a plate girder for a bridge, for a live load of 60 kN/m, and a dead load of 40 kN/m. The girder is simply supported over an effective span of 12 m. Take $f_y = 250$ N/mm^2 and $E = 2 \times 10^5$ N/mm^2. 15