P1593

[5058]-3

T.E. (Civil)

STRUCTURAL DESIGN - I

(2008 Course) (Semester - I)

Time : 4 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1) Answers Q.1 or Q.2, Q.3 or Q.4 from section I and ,Q.5 or Q.6, Q.7 or Q.8 from section II.

    2) Answers to the two sections should be written in separate answer books.

    3) Neat sketches must be drawn wherever necessary.

    4) Figures to the right indicate full marks.

    5) Assume suitable data, if necessary.

    6) Use of electronic pocket calculator, IS 800-2007 and Steel Table are allowed.

    7) Use of cell phone is prohibited in the examination hall.

SECTION - I

Q1) a) Explain in brief design philosophy of limit state design for strength and serviceability. **[10]**

    b) Design a tension member using double equal angle sections back to back on opposite faces of 10 mm thick gusset plate if it carries an axial factored load of 400 kN using 20 mm black bolt. Assume Fe - 415 grade of steel. Draw the design sketch. **[15]**

OR

Q2) a) Differentiate between bolted and welded connection. **[7]**

    b) Explain the classification of cross section and hence find class of ISMB 300@ 44.2 kg/m. **[8]**

    c) A single angle ISA 80 × 80 × 8 mm@ 9.6 kg/m is connected to 8mm thick gusset plate at the ends with 4 Nos. of 16 mm bolts to transfer tension. Determine the design tensile strength of angle section. **[10]**

P.T.O.

Q3) a) Determine the load carrying capacity of a column consisting of ISMB 500@ 86.9 kg/m having a length of 5 m. One end of the column is fixed and other end is pinned. Assume f_y = 250 MPa. **[10]**

b) Design a built - up column 9 m long to carry a factored load of 1000 kN. The column is restrained in position but not in direction at both ends. Design the column by using two channels back to back and single lacing with bolted connection. Draw the design sketches. **[15]**

OR

Q4) a) Design a single angle strut connected to the gusset plate to carry an axial compression of 250kN. The length of the strut between centre to centre intersections is 3m. Design welded connection of the joint. **[10]**

b) Design a gusseted base for a built-up column ISHB 400 @ 82.2 kg/m with two plates 450 mm × 20 mm carrying an axial factored load of 3000 kN. The column is to be supported on concrete pedestal of M20 grade. Draw the design sketches. **[15]**

SECTION - II

Q5) a) A simply supported beam of effective span 4 m carries a factored uniformly distributed load 60 KN/m. The section is laterally supported throughout the span. Design suitable cross section using I - section.**[10]**

b) Design a column of building frame with an effective length 3.5 m subjected to a factored axial load 500kN and factored bending moment 50 kNm. Check for section strength only. **[15]**

OR

Q6) a) Design a suitable I-section for a simply supported beam of span 5m loaded with 20 kN/m dead load and 40 kN/m imposed load. The beam is laterally unsupported throughout the span. Take f_y = 250 Mpa. **[15]**

b) Design a moment resistance base for a ISHB 300 @ 58.8 kg/m column to carry a factored load of 700 kN and factored bending moment 50 kNm.**[10]**

Q7) Design Suitable cross section for welded plate girder for an effective span of 30 m and carrying uniformly distributed load w = 30 kN/m. It is also loaded with two concentrated load of 120 kN acting at 10m from either supports. The compression flange of the girder is laterally supported throughout the span. Also design load bearing stiffener, connection between flange and web plate and draw the design sketches. **[25]**

OR

Q8) A truss of span 20 m and pitch 4m is used for an industrial building situated in Pune. The truss is covered with GI sheet. The height of the truss at the eaves level is 10 m, the spacing between the trusses is 5 m. Assume suitable type of truss and Calculate panel point dead load, live load and wind load. Find the maximum force in bottom and top chord member and design it using suitable angle sections. Show design sketches. **[25]**

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