SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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QUESTION BANK

Subject with Code: Advanced structural steel design (16CE2011)

Course & Branch: M. Tech - Structural Engineering

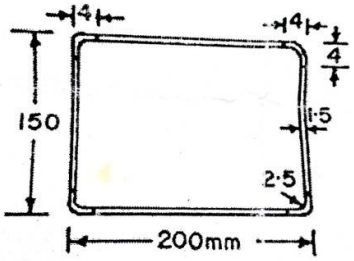
Year & Sem: I M.TECH & II-Sem **Regulation:** R16

UNIT-I

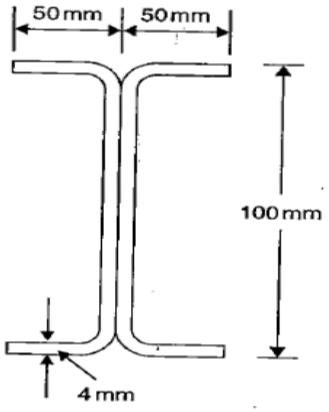
LIGHT GAUGE STEEL STURUCTURES

1. A hat of 100mm x 80mm x 5mm section with a 30 mm lip is to be used as concentrically loaded column of effective length 4.0 mm. Determine the allowable load. Take fy =235 N/mm^2.

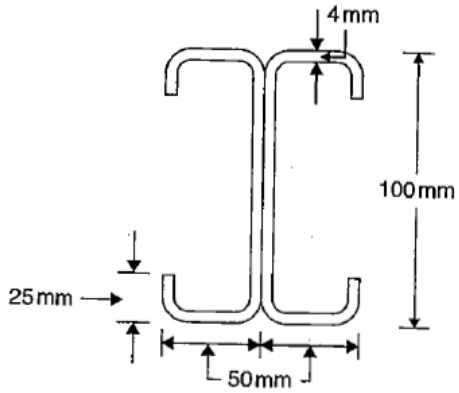
2. Find the allowable axial load for a column section shown in figure. Effective length of the column is 3.6 m. Take fy =235 N/mm^2.



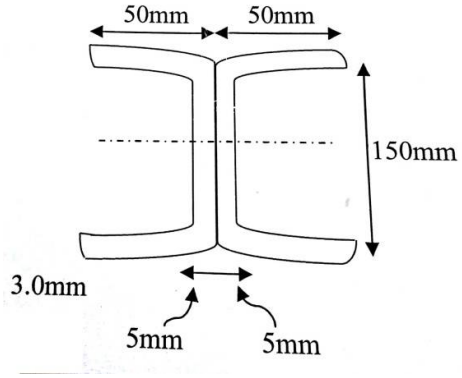
3. Find the permissible load on the column shown in the figure. The effective length of the column is 3m



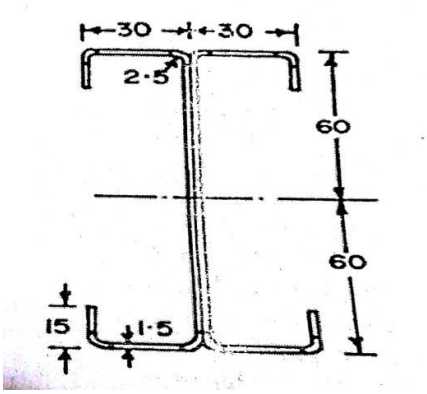
4. Calculate the permissible load on the column section shown in figure. The effective length of the column is 3m.



5. Two channel sections without bent lips 150 mm x 50 mm are connected with webs to act as a beam. The thickness of channel is 3.0 mm. The effective span of simply supported beam is 5.0 m. Determine the maximum uniformly distributed load inclusive of self weight. Which can be supported by the beam. The beam is laterally supported throughout the span.

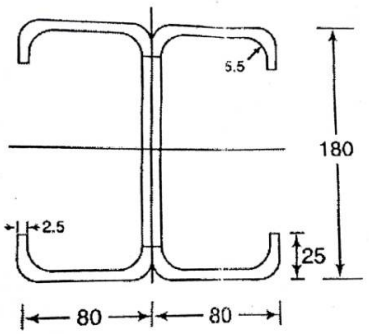


6. The figure below shows the section of a beam which is laterally supported at an interval of 1.5 m. Taking C_b=1.0, Determine the allowable bending moment for the section. Take fy=235 N/mm^2 and E= 2 X 10^5 N/mm^2



7. Two channels of 180mm X 80 mm sections with bent lips as shown in figure are connected with webs to act as a laterally supported beam. The thickness of plate is 2.5 mm and the depth

of the lip is 25 mm. The beam has an effective span of 4.1 m. Determine the allowable load per metre run on the beam. Also Determine the deflection at the allowable load Take fy=235 N/mm^2 and E= 2 X 10^5 N/mm^2



8. Design a hat section for a simply supported beam of effective span 2.5m.The superimposed load is 2KN/m.Yield strength of steel is f_y=235MPa.

9. A hat of 120mm x 120mm x 5mm section with a 30 mm lip is to be used as concentrically loaded column of effective length 4.0 mm. Determine the allowable load. Take fy =235 N/mm^2.

10. Write about

    a) Types of sections used in light gauge steel structure

    b) Local buckling of elements and post buckling of elements

UNIT-II

TRANSMISSION LINE TOWERS & PLASTIC DESIGN

1 a) List out the various uses of steel towers

b) What are the various loads may act on Transmission line towers

2. Write about the design aspects of transmission line towers.

3. Write about

    a) Types of towers (4)

    b) Tower configuration (4)

    c) loads on Transmission Towers(4)

4. Briefly explain about the various structural configurations adopted in towers with neat diagrams. Also explain about the types of braring systems adopted in towers

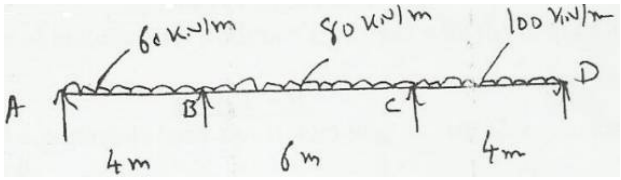
5. A continuous beam ABCD is loaded Span AB length=6m and UDL=20KN/m Span BC length=10m and UDL=25KN/m Span CD length=6m and UDL= 20KN/m. Determine the continuous beam providing most economical section. The yield stress for mild steel is 250 N/mm^2.

6. A simply supported beam of span 6m is subjected to UDL of 20 KN/m.Design a steel beam by plastic design using a combined load factor of 1.7.

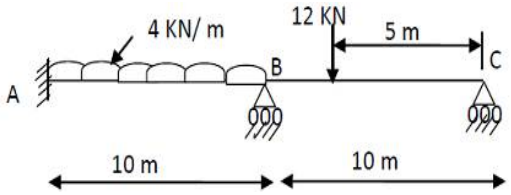
7. A portal frame ABCD with hinged foot has stanchions 4 m high and beam of 6 m span. There is horizontal point load of 40 kN at B. Whole the beam carries a point load of 120 kN at mid span. Using load factor of 1.5, establish collapse mechanism and calculate the collapse Moment.

8. Explain about Idealized stress-strain curve for mild steel

9. a) Explain plastic hinge.
   b) Determine shape factor for triangular section with base width 'b' and height 'h'
   c) Determine M_p for continuous beam shown in the figure. Beam is of uniform section



10. (a) Derive the moment curvature relationship in plastic analysis.
    (b) Calculate the plastic moment capacity required for the continuous beam with working loads shown in figure.



UNIT-III

LIMIT STATE DESIGN

1. Discuss briefly about
   a) Limit state strength and limit state of serviceability
   b) Lug angles
2. Write short note
   a) Strength and types of tension members
   b) Characteristics strength and characteristic load

3. a) Explain stress-strain curve of mild steel and discuss salient point on it.
   b) What are the partial safety factors for materials adopted by IS : 800-2007 code?
4. a) List various loads which are considered in design and discuss any one.
   b) Sketch various types of rolled steel sections available in markets
5. a) Describe briefly advantages and disadvantage of steel structures
   b) Distinguish between Factors of safety and Partial Safety factors
6. Explain the principles of
   a) Working stress method of design
   b) Ultimate load design load
   c) Limit State design
7. (a) Define welding? Explain various types of weld connections with neat sketches?
   (b) What are the advantages and disadvantages of welded connections?
8. (a) Explain properties of structural steel as per IS800: 2007?
   (b) Explain the three types of connections made in steel structures?
9. Define Limit state? Explain the various limit states to be considered in design of steel structures as per IS 800:2007?
10. Explain how limit state design differ from ultimate load design.

UNIT-IV

DESIGN OF TENSION MEMBERS

1. A tension member carries a factored axial tension of 450KN.Design and its connection with a gusset plate and lug angle. Take f_y = 250 N/mm^2 and fu = 410 N/mm^2.
2. Determine size and effective length of the weld to connect two plates with cross section of 150X10mm and 100X10mm subjected to tension of 125kN at working load. Assume required data
3. Design a single angle section for a tension member of roof truss to carry a factored load tensile force of 225kN. The member is subjected to the possible reversal action of wind. The effective length of member is 3m. Use 20mm shop bolts of grade 4.6 for connection.
4. Design a cover plate butt weld using M24 bolts of product grade C and property class 5.6 to connect two plates of size 350mmX16mm for maximum efficiency and one of the shear plane intercepts bolt threads. Assume if any data required.

5. Find the ultimate design strength of ISA 100X100X10mm in tension which is connected to a gusset plate of thickness 12mm through 100mm leg using M20 bolts of property class 4.6 in a single line. Assume that the bolt threads are outside the shear plane and if any data required?
6. A tie member of a roof truss consists of ISA 10075, 8mm. The angles are connected to either side of a 10mm gusset plates are the member is subjected to a working pull of 300kN. Design the welded connection. Assume connections are made in the workshop.
7. . Determine the tensile strength of a roof truss members 2No's of ISA9060, 6 mm connected to the gusset plate of 8mm thickness by 4mm weld. The effective length of weld is 200mm. Assume if any data required (connected leg length is 90mm and outstanding is 60mm).
8. Design bridge truss diagonal subjected to a factored tensile load of 300KN.The length of the diagonal is 3m. Tension member is connected to a gusset plate of 16mm thick with 1 line of 20mm diameter bolts of grade 8.8 Assuming K_b=1, thickness of member is 8mm
9. Select a suitable angle section to carry a factored tensile force of 290 KN.Assuming a single row of M24 bolts and design strength f_y = 250 N/mm^2
10. A single Unequal angle ISA 100 x 75 x 6 is connected to 10 mm thick gusset plate with six 16mm diameter of bolts to transfer tension. Determine design tensile strength if longer legs are connected to gusset. Assume pitch and edge distance 40mm each.

UNIT-V

DESIGN OF BEAMS & DESIGN OF COMPRESSION MEMBERS

1. A simply supported steel joists of 4 m effective span if laterally supported throughout.It carries total UDL of 40KN (Inclusive of self weight).Design an appropriate section using steel of grade Fe410.
2. Design a simply supported beam of span 5 m and carrying factored load 60 KN/m.Beam is laterally supported. Use ISLB section and apply necessary checks.
3. A simply supported steel joist of 4.0 m effective span is laterally unsupported throughtout. It carries a total uniformly distributed load of 40 KN(inclusive of self weight).Design an appropriate section using steel of grade Fe410.
4. Design a laterally supported beam for the following data:

   Effective span =4m
   Maximum bending moment =550 KN-m
   Maximum Shear force = 200KN
   Steel of grade = Fe410

5. Determine the load carrying capacity of the column section of ISMB400 and connected by two plates of 300 X 20mm thick, if its actual length is 4.5m.Its one end may be assumed fixed and the other end hinged. The grade of steel is Fe415 and yield stress of 250 MPa
6. An ISMB 400 @ 604.3 N/m is used as a simply supported beam for 3 m span. The compression flange of beam is laterally supported throughout the span. Determine design flexural strength of member. Also calculate working u.d.l the beam can carry per m span. Check the member for deflection. Take Zp = 1176.18 x 103 mm3, $\gamma mo = 1.1$, $\beta b = 1$ and fy = 250 MPa
7. A column 4m long has to support a factored load of 6000kN. The column is effectively held at both ends and restrained in direction at one of the ends. Design the column using beam sections and plates.
8. Design a built up column with two channels placed face to face. The column is of 6.6 m effective length and supports a factored load 1500KN.Also design the lacing system.
9. Design a builtup column to carry a factored load of 2800KN using ISHB 350@72.4Kg/m and 10mm thick plates. Column is fixed at one end and hinged at other end.
10. Design a double angle discontinuous strut to carry a load of 250KN. The length of the strut between C/C of intersection is 3.5m

Prepared by
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