SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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QUESTION BANK

Subject with Code: Advanced Steel Design(19CE1013) **Course & Branch**: M. Tech - Structural Engineering

Year & Sem: I M.TECH & II-Sem **Regulation:** R19

UNIT -I
Plastic Behavior of Structural Steel

1. 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. [12M]
2. 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. [12M]
3. 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. [12M]
4. a) Explain about Idealized stress-strain curve for mild steel [6M]
   b) Explain fully plastic moment capacity [6M]
5.
   a) Explain plastic hinge. [3M]
   b) Determine shape factor for triangular section with base width ‘b’ and height ‘h’ [5M]
   c) Determine shape factor for Hollow tube section with its external diameter ‘D’ and internal diameter ‘d’ [4M]
6. a) Derive the moment curvature relationship in plastic analysis. [6M]
   b) Calculate the plastic moment capacity required for the continuous beam with working loads shown in Figure1. [6M]

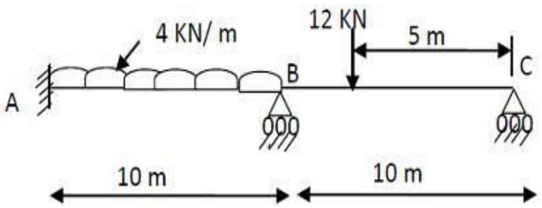


Figure 1

7. Explain fully plastic moment and determine the fully plastic moment required for the frame shown in Figure 2 , if all the members have the same value of Mp. [12M]

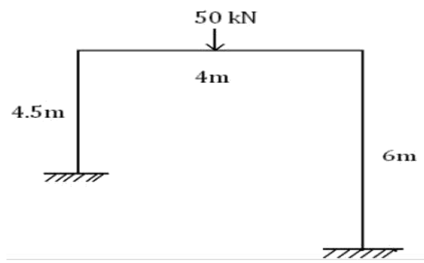


Figure 2

8. Calculate the collapse load for frame as shown in the Figure 3 [12M]

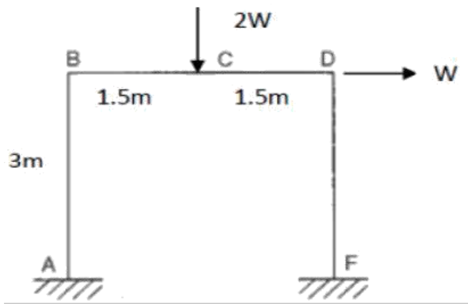


Figure 3

9. Design the continuous beam with the service load as shown in the Figure 4. The load factor may be assumed as 2. Provide a uniform cross section throughout the beam. [12M]

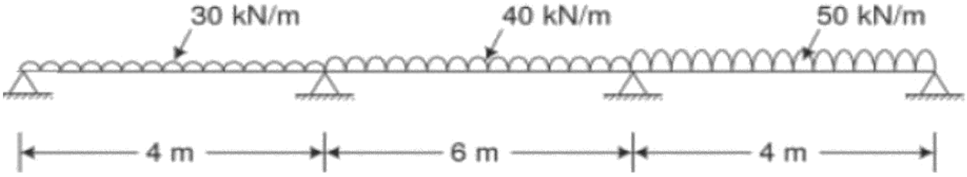


Figure 4

10. Determine the plastic moment for the two bay portal frame to carry working load as shown in Figure 5Take load factor as 1.5 [12M]

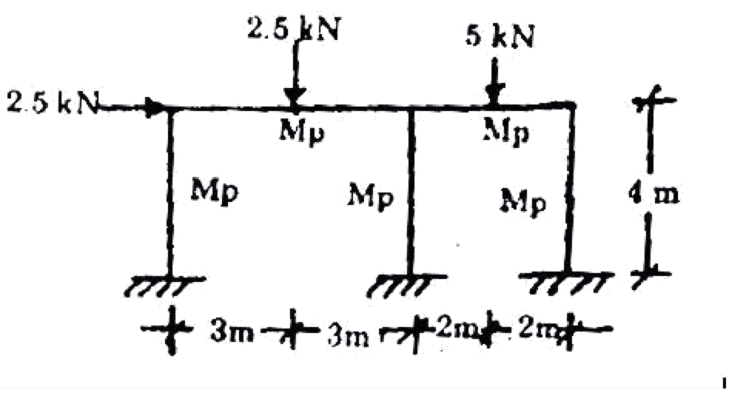


Figure 5

UNIT-II
Design in Light Gauge Steel

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.

[12M]

2. Find the allowable axial load for a column section shown in Figure1. Effective length of the column is 3.6 m. Take fy =235 N/mm^2. [12M]

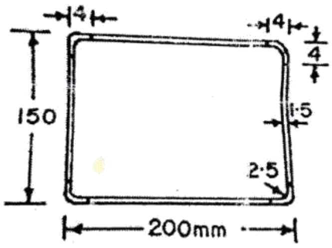


Figure1

3. Find the permissible load on the column shown in the Figure2. The effective length of the column is 3m [12M]

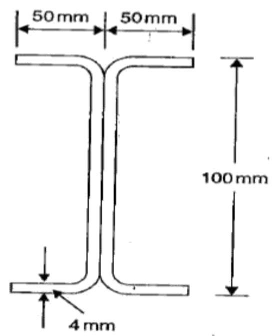


Figure 2

4. Calculate the permissible load on the column section shown in Figure2. The effective length of the column is 3m. [12M]

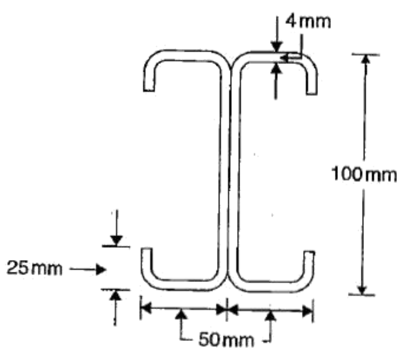


Figure 3

5. Two channel sections without bent lips 150 mm x 50 mm as shown in Figure 4 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. [12M]

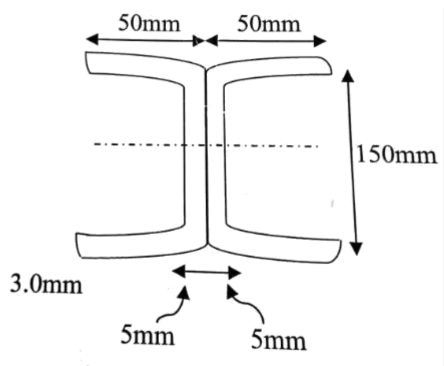


Figure 4

6. The Figure 5 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 [12M]

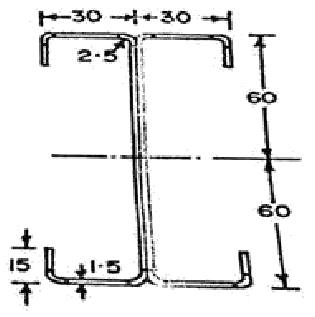


Figure 5

7. Two channels of 180mm X 80 mm sections with bent lips as shown in Figure 6 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 4.0 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 [12M]

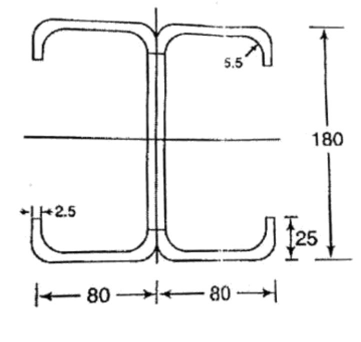


Figure 6

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. [12M]

9. A hat of 100mm x 100mm 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. [12M]

10. Write about

  a) Types of sections used in light gauge steel structure [6M]

  b) Local buckling of elements and post buckling of elements [6M]

UNIT-III

Transmission Line Towers

1. a)List out the various uses of steel towers [6M]

   b) List out the types of towers & Explain briefly [6M]
2. What are the various loads may act on Transmission line towers [12M]
3. Write about the design aspects of transmission line towers. [12M]
4. Write about
   a) Tower configuration [6M]
   b) Loads on Transmission Towers [6M]
5. Briefly explain about the various structural configurations adopted in towers with neat diagrams. Also explain about the types of bearing systems adopted in towers [12M]
6. Steel tower is to be connected for a transmission line for a single circuit 3 phase 5 cycle per sec(cps)to transmit 50 MW at 0.75 power factor for 259 KW

   Voltage of transmission =132KV

   Power conductor =30mm Ø AC SR

   Consisting of 54 strants of 3mm Ø of aluminum and 7 strants of 3mmØ of steel shall be used

   Unit weight of conductor =16.76 N/m

   Permissible Axial tension =35.60 kN

   Young's Modulus of elasticity =0.842 x 10^5 N/mm^2

   Coefficient of expansion = 0.00001992/^{0}C

   Shape factor for Conductor =0.67

   Ground Wire =10 mm Ø galvanished steel wire shall be used

   Permissible axial tension =25.40kN

   Clearance Requirements

   Vertical height of the conductor above the ground 6.7 m (minimum)

   Vertical spacing between power conductors 3.5 m (min)

   Horizontal spacing between the conductors 6.25 m (min)

   Height of the ground wire above topmost conductor shall be half of the horizontal spacing of power conductors.

   Variation of temperature in the range of 5^{0}C to 60^{0}C

   Wind

   Uninform intensity of wind =1.5 kN/m^2

   Snow fall is not expected

   Tower

   Target type of tower with not more than 2^{0}line variation shall be erected

   Weight span of the tower = wind span =240 m

   Suggest the geometry of the tower and determined length of every member of the tower [12M]
7. Explain the procedure for design of self-supporting simple towers. [12M]
8. Explain the Procedure for analysis of self-supporting simple towers [12M]
9. Steel tower as shown in figure 1 is to be connected for a transmission line for a single circuit 3 phase 5 cycle per sec(cps)to transmit 50 MW at 0.75 power factor for 259 KW,determine the

various forces(lateral forces due to wind, longitudinal force, if any, torsional force ,if any and dead load) acting on the tower under the following conditions [12M]

a) Normal operating conditions

b) Top most power conductor in broken condition

c) Ground wire in broken condition

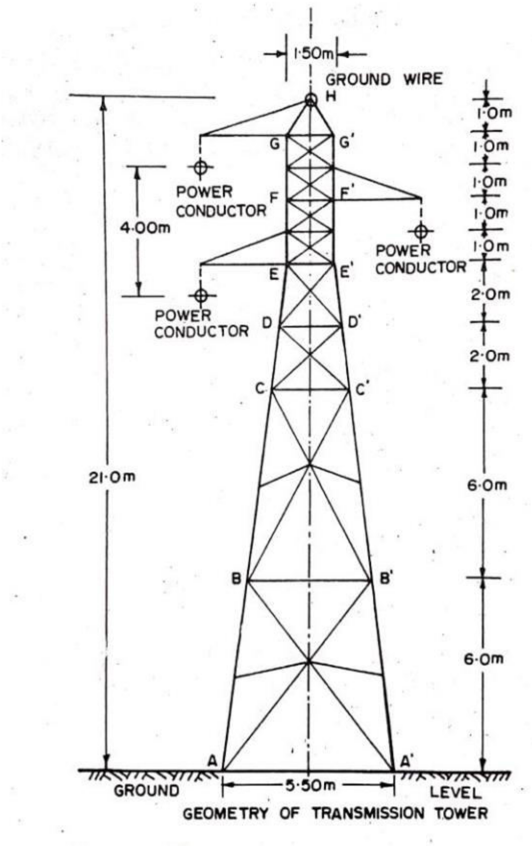


Figure1

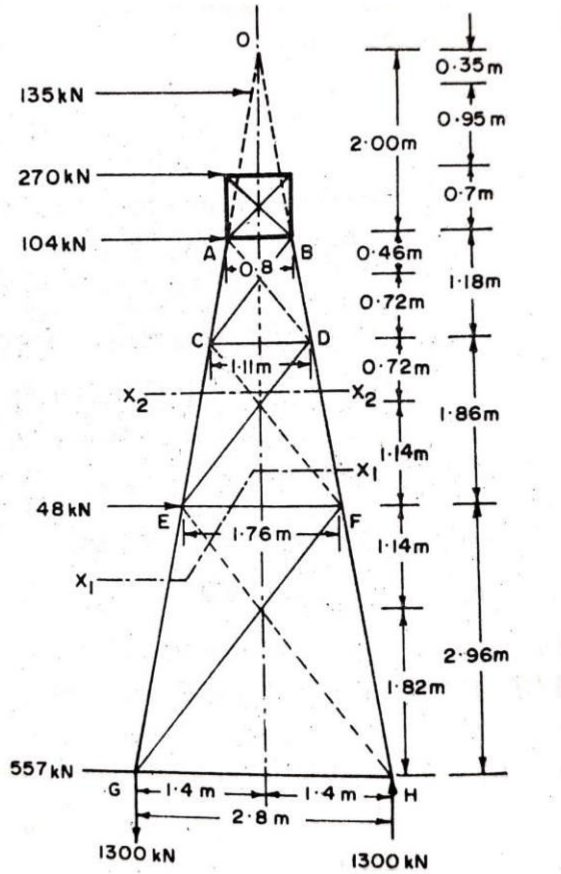


Figure2

10. Analyse the steel tower subjected to loads as shown in Figure 2 [12M]

UNIT-IV

Tubular Structures

1. Briefly explain the various steps involved in the design of roof trusses. [12M]
2. Design member AB,AC,and joint A of a roof truss as shown in Figure 1 for the following data [12M]

Member	Length	Compressive force	Tensile force
AB	2.3 m	60kN	55kN
AC	1.8 m	55kN	80kN

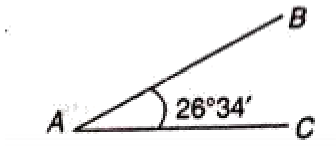


Figure1

3. Design a purlin section for the following data [12M]
   Spacing of roof trusses C/C =5m
   Dead load of roofing =0.5kN/m
   Live load on purlin =1.1kN/m
   Wind load on Purlin =-1.5kN/m

4. Design joint A of a tubular roof truss and the member meeting at the joint A, the line diagram of which is shown in Figure 2 [12M]

Member	Length	Compressive force	Tensile force
AB	2.2 m	110kN	38kN
AC	2.8 m	32kN	87kN

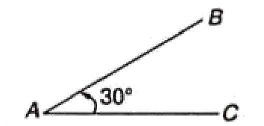


Figure 2

5. A tie member in a roof truss is connected to the principal rafter at an angle of 90^0.Design the members and the connections for the following data. Use grade Y_{st}=240 tubes [12M]

S.No	Member	Length	Force
1	Principal rafter panel	2.6 m	85kN
2	Tie member	2.2 m	35kN

6. a) Compare the hollow circular & hollow square section as thin tubular sections, for its strength with respect to use as compression member [6M]
   b) Enlist the loads acting on the structure and write on live load calculation for roof truss [6M]
7. a) State advantages & disadvantages of tubular sections in steel structure [6M]
   b) Write note on design considerations as per IS code for tubular structure used as scaffolding [6M]

8. a) Explain briefly about the behavior of tubular sections in steel structures [6M]
   b) Write the classification of steel tubular sections [3M]
   c) Write the effect of combined stress subject to tubular steel structures [3M]
9. a) Explain briefly about connections in tubular steel structures [6M]
   b) Write down requirement of minimum thickness for tubular steel structures [6M]
10. Design a purlin for a roof truss having the following data: [12M]
    Spacing of truss = 3m c/c,
    Spacing of Purlin = 2m c/c
    Wind pressure = 2.5 kN/m, Roof coverage= AC
    Sheeting weighing 700N/m
    Live load on purlin=1.4 kN/m

UNIT-V

Design of Industrial Buildings

1. Design a steel roof truss shown in Figure 1 for a clear span of 12.0 m. the truss is supported over masonry columns 45 cm x 45 cm trusses are placed 3 m c/c and support galvanised iron sheet on rafters and steel purlins. The rise of the truss is 1/3 of span. The design wind pressure may be assumed to be 1000N/m^2 [12M]

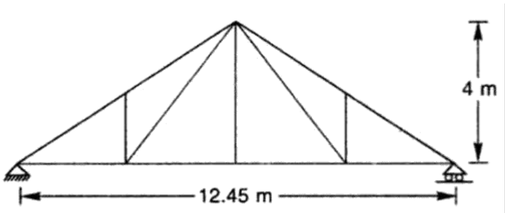


Figure 1

2. Determine the design forces in the members of the steel roof truss as shown in the Figure 2 16m span and resting on brick masonry walls. The trusses are placed 8m c/c. the rise of the truss is ¼ of the span. Roofing is of asbestos cement of dead load 171 N/ mm2.The wind load normal to roof truss is 940N/ mm2. One end of the truss is hinged and the other end is supported on rollers. [12M]

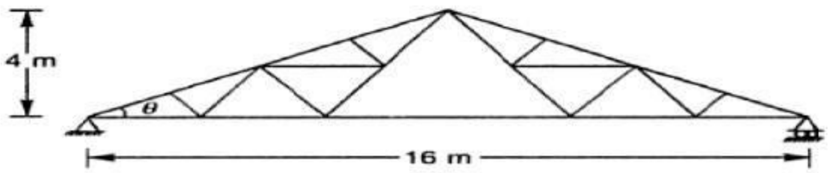
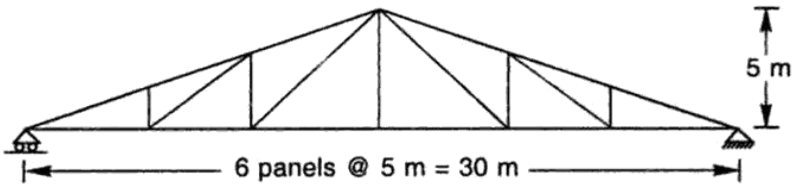


Figure 2

3. Describe and design a simply supported gantry girder to for the following data: [12M]
   Crane capacity : 160 KN
   Self weight of crane girder : 200 KN
   Self weight trolley, electric motor, hooks etc. : 50KN
   Min. approach of crane hook to the gantry girder : 1.6 m
   Wheel base : 2.8 m
   c/c distance between gantry rail : 12 m
   c/c distance between column : 6m
   Self weight of rail section : 300 N/m
   Check the section for maximum bending moment due to vertical forces, lateral forces and longitudinal forces.
4. a) Explain briefly about Structural Framing [5M]
   b) What are the sections that are normally used as purlins or Girts? [4M]
   c) State difference between a purlin and a girt. [3M]

5. Illustrate elaborately about the items that are to be considered while planning and designing an industrial building. [12M]
6. Explain various steps involved in the design of gantry girder. [12M]

7. Describe and design a Pratt-truss as shown in Figure 3 the design wind pressure is 1200N/m2. The trusses are covered with AC sheets and the centre-to-centre spacing of trusses is 6m.



[12M]

Figure 3

8. Design a roof truss, rafter bracing, purlin for an industrial building located at Guwahati with a span of 20m and a length of 50m The roofing is galvanized iron sheeting Basic wind speed is 50m/s and the terrain in an open industrial area Building is class B with a clear height of 8m at the eaves [12M]
9. a) Name some of the cladding /decking materials that are used in practice. [6M]
   b) List out items to be considered while selecting a cladding/decking system [3M]
   c) What are the functions of an eave strut? [3M]
10. Design Girts in an industrial building for the following data [12M]

Height of columns	=11m
c/c spacing of columns	=8 m
Span of truss	=16 m
Side coverings	=AC Sheets
Intensity of wind pressure	=1.05 kN/m^2