SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

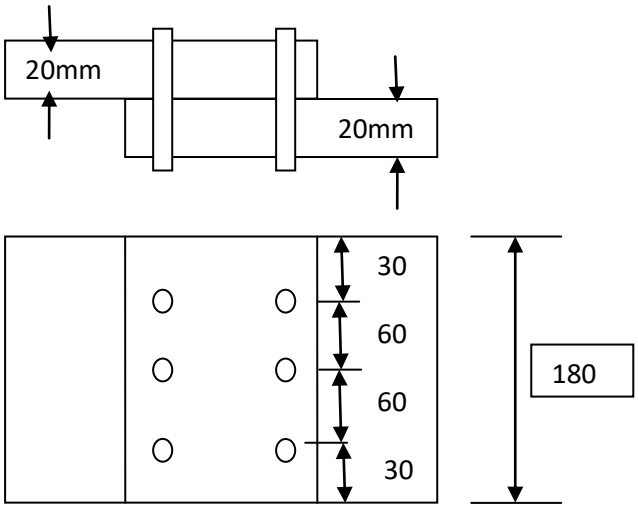
Subject with Code :Design & drawing of Steel Structures(16CE126) **Course & Branch**: B.Tech & CE

Year & Sem: III-B.Tech & II-Sem **Regulation:** R16

UNIT-I

Introduction,Rivet,Bolt &Welded Connection

1. (a) Explain the various types of bolted connections with neat sketches **[6M]**
   (b) A 18mm thick plate is joined to 16mm plate by 200 mm long(effective) butt weld. Determine the strength of joint if (i) A Double V butt weld is used and (ii) A Single V butt weld is used**.** **[6M]**
2. Find the efficiency of the lap joint shown in figure. Given by M_{20} bolts of grade 4.6 and Fe $_{410}$(E250) plates are used. **[12M]**

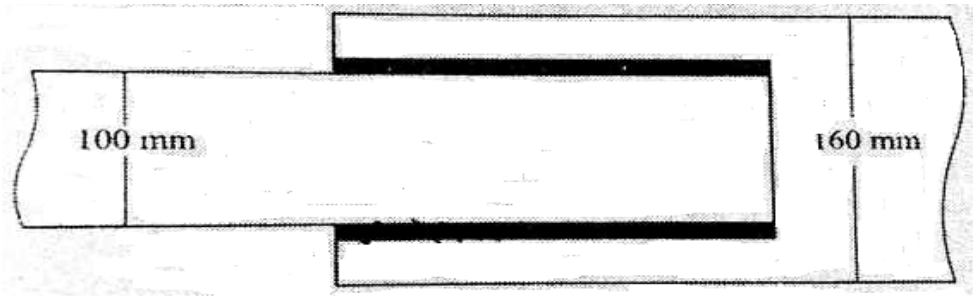


3. (a) Explain advantages and disadvantages of steel structure. **[6M]**
   (b) A double riveted double cover butt joint is used to connect plates 12mm thick. Using Unwin's formula, determine the diameter of river, rivet value, gauge and efficiency of joint. Adopt the following stresses: **[6M]**

   Working stress in shear in power driven rivets = 100 N/mm^2 (mpa)
   Working stress in bearing in power driven rivets = 300 N/mm^2 (mpa)
   For plates working stress in axial tension is $0.6f_y$
   F_y =260 N/mm^2 (mpa)

4. (a) Define welding. Explain various types of weld connections with neat sketches. **[6M]**
   (b) What are the advantages and disadvantages of welded connections? **[6M]**

5. (a) Explain various types of failures of Riveted Joints. **[6M]**
   (b) Design a suitable longitudinal fillet weld to connect the plates as shown in figure to transmit a pull equal to the full strength of small plate. Given plates are 12 mm thick, grade of plate Fe 410 and welding to be made in workshop. **[6M]**



6. (a) Define rivet. Explain various types of rivet connections with neat sketch. **[6M]**
   (b) Explain various types of failures of Riveted Joints **[6M]**

7. (a) Define bolting. Explain various terminologies in bolted connections. **[6M]**
   (b) Difference between Ordinary black bolts and High strength Friction Grip bolts. **[6M]**

8. (a). A 20mm thick plate is joined to 18mm plate by 200 mm long(effective) butt weld. Determine the strength of joint if a Single V butt weld is used. **[8M]**
   (b) Explain Lap and Butt joints of rivet. **[5M]**

9. (a) Explain about the strength of a Riveted joint. **[8M]**
   (b) A single riverted lap joint is used to connect plate 10mm thick. If a 20mm diameter rivetes are used at 55mm gauge. Determine the stress of joints and its efficiency **[5M]**
   Adopt the following stresses:
   Working stress in shear in power driven rivets = 80 N/mm^2 (mpa)
   Working stress in bearing in power driven rivets = 250 N/mm^2 (mpa)
   For plates working stress in axial tension is $0.6f_y$
   F_y =260 N/mm^2 (mpa)

10. Define the following:
    (a) Types of loads considering in steel structures **[2M]**
    (b) Properties of steel structures **[2M]**
    (c) Structural steel **[2M]**
    (d) Butt welded connection **[2M]**
    (e) Rivet and Bolt Connection **[2M]**
    (f) steel structure **[2M]**

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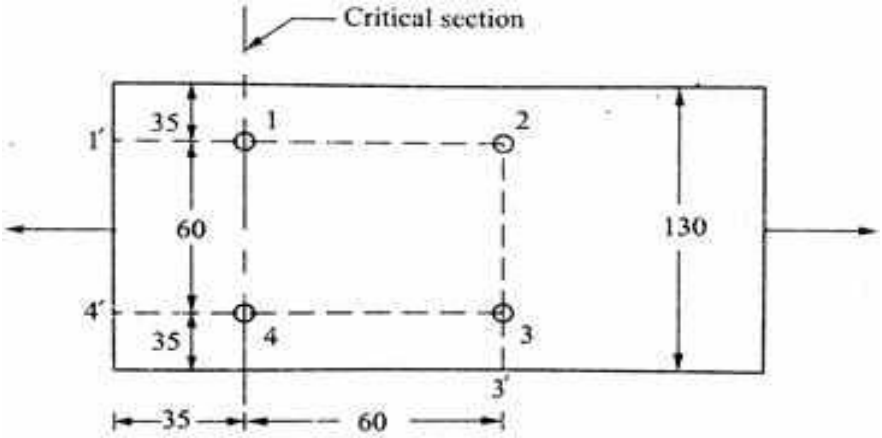
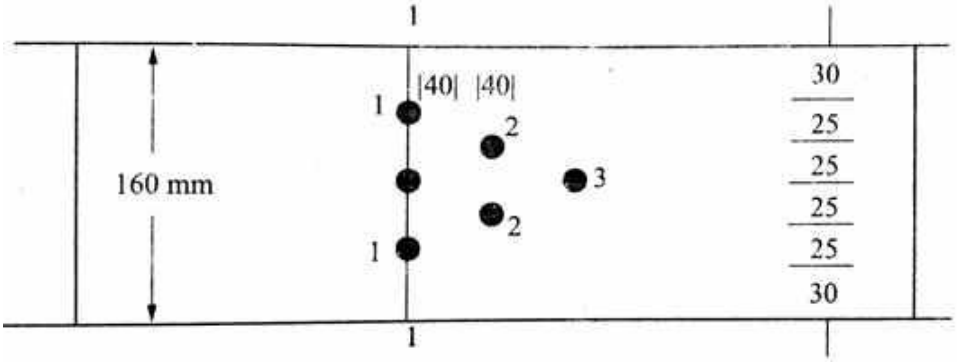
UNIT-II

Tension Members

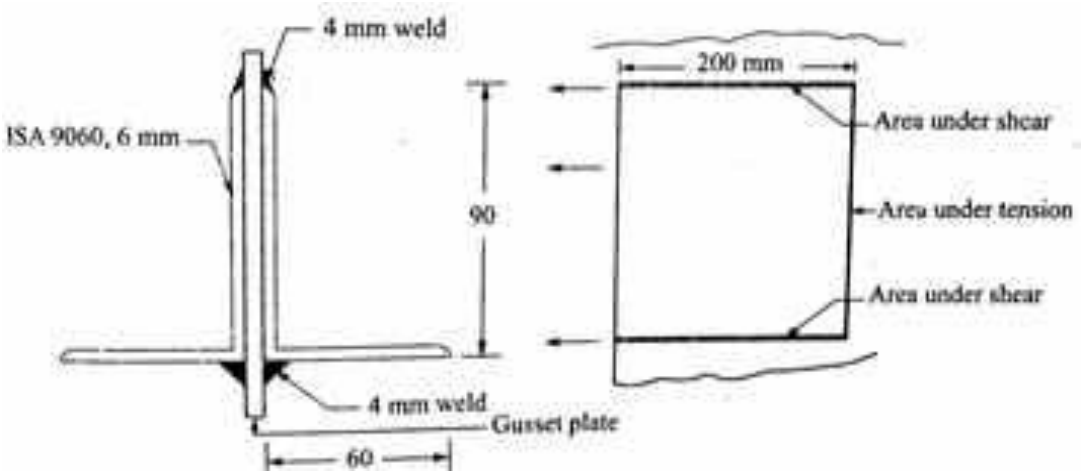
1. Determine the Design strength of the plate 130mmX12mm with the holes for 16mm diameter bolts as shown in figure. Steel used to Fe 410 grade quality. **[12M]**



2. Determine the Design Tensile strength of 160X8 mm plate with the holes 16 mm as shown in figure below.Plates are of steel grade Fe 415. **[12M]**



3. Determine the tensile Strength of a roof truss member 2ISA 9060,6 mm connected to the gusset plate of 8mm thickness by 4 mm weld as shown in figure below.The effective length of weld is 200mm. **[12M]**



4. A tension member of a roof truss carries a factored axial tension of 430 KN. Design the section and its connection without using lug angle. **[24M]**

5. Design a double angle tension member connected on each side of a 10 mm thick gusset plate,to carry an axial factored load of 375 KN. Use 20 mm black bolts, Assume shop Connection. **[24M]**

6. Design a tension splice to connect two tension member plates o size 200×10 mm and 220×12 mm. the member is subjected to a factored tensile force of 280 KN. Use M20 grade 4.6 ordinary bolts for the connection . **[12M]**.

7. A tension member carrying a factored tensile load of 180 KN has to convert through a gusset plate of 10 mm thick using 16 mm diameter of ordinary bolt of grade 4.6. The available length of the gusset plate for making connection is 250 mm. Design the member and its connection also design the lug angle if required. **[24M]**

8. Design a double angle tension member connected on each side of 10mm thick gusset plate to carry on axial factored load of 450 KN . use 20mm thick black bolts. Assume shop connection **[24M]**

9. Design a Splice to connect a 300X20 mm plate with a 300X10mm plate. The design load is 500KN .Use 20mm black bolts of grade 4.6 ordinary bolts fabricated in the shop. [**12M]**

10. A tension member of a roof truss carries a factored axial tension of430 KN. Design the section and its connection using lug angle **[24M]**

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UNIT-III

Compression Members

1. Design a single angle strut connected to the gusset plate to carry 180 KN factored load. The length of the strut between center to center connections is 3m. **[12M]**
2. A column 4 m long has to support a factored load of 6000 KN. 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. **[12M]**
3. Design a laced column with two channels back to back of length 10 m to carry an axial factored load of 1400 KN. The column may be assumed to have restrained in position but in direction at both ends (hinged ends). **[24M]**
4. Design a single lacing system for a column of effective length 9 m to support an axial factored load of 1500 KN. Design the column which shall consists of two channels placed back to back at suitable spacing. **[24M]**
5. Design a built up column of length 10 m carrying an axial factored load of 1400 KN. The column may be restrained in position but not in direction at both ends. Design battens instead of lacing system. **[24M]**
6. Determine the design axial load capacity of the column ISMB300@577 N/m **,** If the length of the column is 3m and its both ends pinned. **[12M]**
7. A column section ISHB 300 @ 577 N/m is carrying a factored load of 600 KN. A factored moment of 30 KN-m and factored shear force of 60 KN. Design a suitable column splice. Assume ends are milled. **[12M]**
8. An upper storey column ISHB 300 @ 577 N/m carries a factored load of 1200 KN and a factored moment of 12 KN-m. It is to be spliced with lower storey column ISHB 400 @ 806 N/m. Design a suitable splice. **[12M]**
9. Design a slab base for a column ISHB 300 @ 577 N/m carrying an axial factored load of 1000 KN .M20 Concrete is used for the foundation .Provide welded connection between column and base plate. **[12M]**
10. Design a gusseted base for a column ISHB 350 @ 710 N/ m with two plates 450 mm X250mm carrying a factored load of 3600 KN. The column is to be supported on concrete pedestal to be built with M20 concrete. **[12M]**

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UNIT – IV
Beams

1. Design a simply supported I-section to support the slab of hall 9m X 24m with beam spaced at 3m centre to centre. Thickness of slab is 100mm. Consider floor finish load 0.5 KN/m^2 and live load of 3 KN/m^2. The grade of steel is E=250. Assume that adequate lateral support is provided to compression flange. **[12M]**
2. Design a SSB of span 6m carrying a udl of 20 KN/m including self-weight. If the compression flange of the beam is laterally supported (or) restrained. Check the beam for moment carrying shear and deflection. The grade of steel is Fe 250. **[12M]**
3. Design a beam 4m effective length subjected to 50 KN/m UDL (Including self weight) the flanges are embedded in slab and simply supported at both the ends. **[12M]**
4. Design a simply supported I-section to support the slab of hall 9m X 24m with beam spaced at 3m centre to centre. Thickness of slab is 100mm. Consider floor finish load 0.5 KN/m^2 and live load of 3 KN/m^2. The grade of steel is E=250. Assume that adequate lateral support is provided to compression flange for web buckling and web crippling, if stiff bearing is over a length of 75mm. **[12M]**
5. Design a simply supported I-section to support the slab of hall 6m X 12m with beam spaced at 3m centre to centre. Thickness of slab is 125mm. Consider floor finish load 0.5 KN/m^2 and live load of 5 KN/m^2. The grade of steel is E=250. Assume that adequate lateral support is provided to compression flange. **[12M]**
6. Design a SSB of 10 m effective span carrying a total factored load of 60 KN/m. The depth of beam should not exceed 500 mm. The compression flange of the beam is laterally supported by floor construction. Assume stiff end bearing is 75 mm. **[12M]**
7. Design a beam 6m effective length subjected to 50 KN/m UDL (Including self weight) the flanges are embedded in slab and simply supported at both the ends. **[12M]**
8. Design a SSB of span 9m carrying a udl of 25 KN/m including self-weight. If the compression flange of the beam is laterally supported. Check the beam for moment carrying shear and deflection. The grade of steel is Fe 250. **[12M]**
9. When a SSB of 6 m effective span carrying a total factored load of 40 KN/m. The depth of beam should not exceed 500 mm. the compression flange of the beam is laterally supported by floor construction. Assume stiff end bearing is 75 mm. **[12M]**
10. Design an I-section purlin for an industrial building to support a galvanized corrugated iron sheet roof given. Spacing of trusses=5m. spacing of purlins= 1.5m. Inclination of main rafter to horizontal = 30^0. Weight of galvanized sheets taking into account laps and connecting bolts=130N/m^2 . Imposed snow load=1.5KN/m^2. Wind load = 1 KN/m^2. **[12M]**

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UNIT – V
Roof Trusses

1. Explain Loads on roof trusses and also mention load combinations **[12M]**

2. A roof truss shed is to be built in Lucknow for an industry. The size of shed is 24 m X 40 m. The height of building is 12 m at the eves. Determine the basic wind pressure. **[12M]**
3. A power plant structures having maximum dimension more than 60 m is proposed to be built on downhill side near Dehradun. The height of the hill is 400 m with a slope of 1 in 3. If the location is 250 m from the crest of the hill on downward slope, and its eve board is at a height of 9 m, determine the design wind pressure. **[12M]**
4. Determine the design loads on the purlins of an industrial building near Visakhapatnam, given Class of building: General with life of 50 years **[12M]**
   Terrain : Category 2
   Maximum dimension; 40 m
   Width of building: 15m
   Height at eve level : 8 m
   Topography : ɵ less than 3^0
   Permeability : Medium
   Span of truss : 15 m
   Pitch : 1/5 and Sheeting is A.C.sheets
   Spacing of purlins and trusses are 1.35 m & 4 m.
5. Explain detail the steps involved in the design of channel purlin of a steel roof truss. **[12M]**

6. Define a roof truss and also draw neat sketches on types of roof trusses **[12M]**

7. (a) List out the various elements of the roof truss and mark all its significance. **[12M]**
   (b) How to calculate the deflection of trusses? **[12M]**

8. Design angle purlin for the following data by simplified method: **[12M]**
   Spacing of trusses=4m
   Spacing of purlins=1.6m
   Weight of A.C sheets including laps and fixtures=0.205kN/m^2
   Live load=0.6 kN/m^2
   Wind load=1 kN/m^2
   Inclination of main rafter of truss=210

9. Determine dead load, live load and wind load per panel point for roof truss of work shop shed constructed at Ahmedabad for following requirement. **[24M]**
   (i) Span of truss =15 m
   (ii) Spacing of truss= 4m c/c
   (iii) Rise of truss =3m
   (iv) Height of truss above ground level= 20 m
   (v) A.C.C sheet @ 150 N/m^2 are used as roof covering
   (vi) Assume weight of purlin and other fixtures= 120 N/m^2 per plane area
   (vii) Total number of panels=8 No's

10 Define the fallowing the terms
   (a) Types of roof truss **[2M]**
   (b) Purlins **[2M]**
   (c) Components of steel roof truss **[2M]**
   (d) Load combinations **[2M]**
   (e) Give general guidelines for fixing spacing of roof trusses **[2M]**
   (f) Roof truss **[2M]**

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