KINGS

COLLEGE OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

Question Bank

Sub. Code/Name: CE1354 – DESIGN OF STEEL STRUCTURE

Year/Sem: III / VI

Unit 1

Part – A

1. What are the merits and demerits of welded connection?

Merits

1. There is silence in the process of welding
2. The welding may be done quick process.

De merits

1. The members are likely to distort in the process of welding
2. The welded joints are over rigid

2. What are the properties of steel structure?

Physical properties
Chemical properties

3. State the different limit state?

Limit state of strength
Limit state of serviceability

4. Enlist types of Bolted connections?

Lap joint
Butt joint

5. What are special considerations while designing of steel design?

Size and Shape
Buckling
Minimum Thickness
Connection Designs.

6. Name the types of connection in steel member?

Riveted connection
Bolted connection
Welded connection

7. What are the design philosophies?

Working stress method (WSM)
Ultimate Load Design(ULD)
Limit State Design(LSD)

8.Mention the Advantages of working stress method?

This method is simple
This is reasonable reliable
As the working stresses are low, The serviceability required are satisfied automatically.

9.Mention the Advantages of Ultimate load design?

Redistribution of internal forces is accounted
It allows varied selection of load factors

10. What is meant by lap joint?

It is the simplest type of joints. In this the plates to be connected overlap one another.

11.What is meant by Butt joint?

In this type of connection two main plates a butt against each other and the comnnection is made by providing a single cover plates connected to main plate or by double plates, one on either side of connected to the main plates.

12. What are the types of welded joints?

Butt weld
Fillet weld
Slot weld and plug weld.

Part – B

1. Design a single bolted double cover butt joint to connect plates of fy 410 grade having thickness 16mm. Use M16 bolt of grade 4.6. Find the efficiency of the joint?

2. A tie member of a roof truss consist of 2nos of ISA 90mmX60mmX10mm. The angles are connected on either side of 12 mm gusset plate and the member is subjected to the pull of 400Kn.Design the welded connection ?

3. A Single riveted double cover butt joint is used to connect two plates 12mm thick. The rivets used are power driven 18mm in diameter at a pitch of 60mm. Find the safe load per pitch length and the efficiency of the joint.

4. A tie member consisting of angle section 80mm X 60mmX8mm is welded to a 8mm gusset plate. Design the weld to transmit a load equal to the full strength of the member?

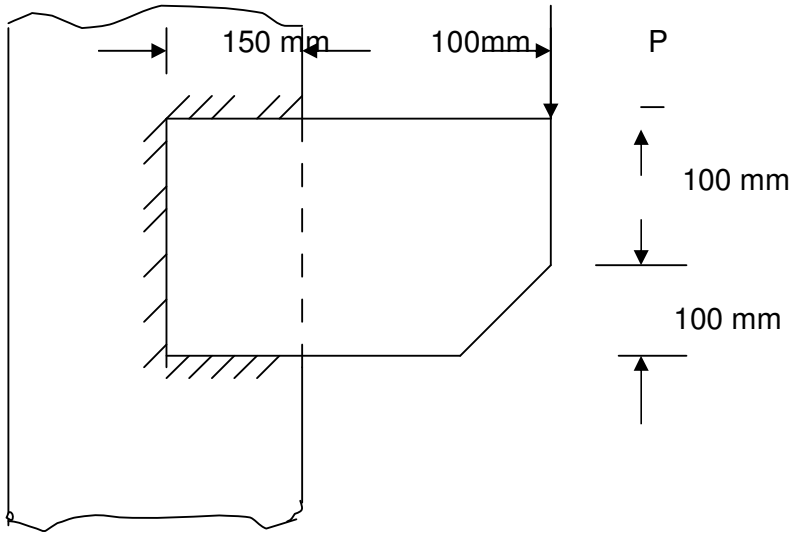
5. Explain the various types of loads and load combination to be considered in the design of steel structure ?

6. Explain how limit state method differs from the working stress method of design?

7.Two section 10mm and 18mm thick are to be jointed by double cover butt joint. The joint is double riveted with cover plates each 8mm thick. The load to be transferred by the joint is 500kN. Design the joint and riveted on packing?

8. Design a suitable filler weld to connect a tie bar 80 x 8 mm at its end to a 10mm thick gusset plate. Joint has to carry a tensile load of 96 KN, The permissible stresses I the tie bar and fillet weld are 150 Mpa and 108 Mpa respectively?

9. A bracket plate is used to transmit reaction P from a beam to column flange as shown in figure. The bracket plate is connected to flange of column by 6mm fillet weld. Compute the maximum reaction P. also determine the necessary thickness of bracket plate.



Unit – II

Part – A

1. **What is meant by tension member?**
   A tension member is defined as a structural member subjected to tensile force in te direction parallel to its longitudinal axis. A tension member is also called as a tiemember or simply a tie.

2. **What are single angles?**
   The member are attached with gusset plates in the roof trusses. The tension in the member become eccentric. The distribution of stress over the section become non- uniform.

3. **What in meant by Double angles in tension member?**
   The angles are connected to on the opposite sides of the plates also experience the effect of shear lag.

4. **What are the types of tension members ?**
   Wires and cables
   Rods and bars
   Single structural shapes and plates
   Built up members

5. **Define plastic range?**
   After the top stress to lower yield, its remains sensibly constant for the considerable increase in strain called plastic range.

6. **Define ultimate strength ?**
   In tension test of steel bar the highest stress related to the orginal cross-sectional area of the specimens when the material of the bar many withstand is called the ultimate strength.

7. **What is necking ?**
   Reaching the magnitude of the ultimate strength a shape local reduction of the cross section occurs which is called necking.

8. **What chain riveting in tension member?**
   The holes are made in parallel lines parallelto the longitudinal axis of the member.

9. **Define stress concentration in tension member?**
   The maximum elastic stress adjacent to the hole is nearly 2 to 3 times more than the average stress. The ration of this maximum elastic stress to the average stress called as stress concentration.

10. **What is meant by lug angles in tension members?**
    Lengtrh of the end connection of angle or channel section to a gusset plate is reduced by using lug angles. Lug angle used with single angle member.

Part – B

1.Design a tension member of length 3.6m between/c of intersections and carrying a pull of 150kN. The member is subjected to reversal of stresses.

2.Design a tension member to carry a load of 300kN. Two angles placed back to back with long leg outstanding are desirable. The length of the member is 3m.

3.Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225 KN. The member is subjected to the possible reversal of stress due to the action of wind. The effective length of the member is 3m. use 20 mm shop bolts of grade 4.6 for the connection.

4.Design a double angle tension membe 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.

5. Design a single angle tension member to carry tensile force of 200 KN. The length of member between center to center of intersection is 2.0 m. Take f y =250 mpa.

6.Design a Tension member using two angles back to back on the same side of a 12 mm thick gusset plate to carry a tensile force of 330 KN. The length of member from center to center of intersection is 3.6 m. Assume the member is connected to gusset plate by 20 mm dia. Bolts. Assume fy=250 mpa.

7. A Tension member consisting of pair of angles is to carry a pull of 300 KN. connected to a gusset plate by their short legs.
   i)Design the section if the angles are connected on the same side of gusset plate.
   ii)Design the section if the angles are connected to each side of gusset plate.

UNIT- III

PART - A

1.Enlist the failure mode of compression members due to overloaded?

Direct compression
Excessive bending
Twisting
Bending combined with twisting.

2.Define slenderness ratio of a Column?

Slenderness ratio of a column is defined as the ratio of effective length to corresponding radius of gyration of the section.

Slenderness ratio = Le/r = KL/r

3.What are the commonly used lateral systems in members?

Lacing or latticing
Battening

4.Define lacings?

The lacing are subjected to shear forces due to horizontal forces on columns.

5. Define battens?

Instead of lacing one can use battens to keep members of columns at required distances.

6.Define Column Splicing?

Connecting two pieces of sections to get the required length of column is called column Splicing.

7.What are the two distinct types of compression splices?

Those having ends cut by ordinary method
Those having the ends cut and milled.

8.What are the two types of column bases used in practice?

Slab base
Gusseted bse.

9. What is meant by slab base?

This are used in column carrying small loads. In this type the column is directly connected to the base plate through cleat angles the load transferred to the base plate through bearing.

10. What is meant by gusseted base?

For column carrying heavy loads gusseted bases are used. In gusseted base, the column is connected to base plate through gussets. The load is transferred to the base partly through bearing and partly through gussets.

Part –B

1. Determine the design axial load capacity of the column ISHB 300 @ 577 N/m if the length of column is 3m and its both ends pinned?

2. In a truss a strut 3m long consist of two angles ISA 100100,6mm. Find the factored

3. strength of the member if the angles are connected on both sides of 12mm gusset by
    i) one bolts
    ii) ii)two bolts
    iii) Welding which makes the joint rigid.

4. Design a column with double lacing system to carry a factored axial load of 1800 KN. The effective height of column is 4.5m. use two channels placed back to back.

5. Design a gusseted base to carry a factored axial load of 2800KN.The column consists of ISHB 450 @0.855KN/m with two cover plates 250mm x 250mm on either side. Take the effective height of column as 4m.

6. Design a column to support an axial load of 700KN. The column has an effective length of 7m with respect to the x-axis and 5m with respect to the y-axis.

7. A column section ISHB 350 @ 674 N/m carries an axial load of 1100KN. Design a suitable gusset base. Allowable bearing pressure on concert is 60kN/m2.

8. Design completely a built up column composed of channel section placed back to back and carrying an axial load of 1500kN.its length Is 6m and it is effectively lateral position at both ends and restrained against rotation at one ends take fy =250 N/mm2?

9. Design a gusseted base for a column ISBH 450 @ 87.2 kg/m, carrying an axial load of 2000kN. Take the allowable bearing pressure on concrete a 10N/mm2.

UNIT- IV

PART - A

1. Define beam ?

Beam is a structural memberwith length considerably larger than cross sectional dimension subjected to lateral which gives to bending moment shear forces in the member. Purlins which rest between the trusses and support roof sheets are beams.

2.what are the classification of cross section?

Class 1 –Plastic
Class 2 – Compact
Class 3 – Semi-compact.
Class 4 – slener.

3.Mention the design procedure of a beam member?

A trial section is selected assumed it is going to be plastic section
Then it is checked for the class it belong
Check for bending strength
Check for shear strength
Check for the deflection.

4.Define Plastic hinge?

The fiber carrying bending tensile stress equal to yield stress tend to expand. The section acts like a hinge. This hinge is known as a plastic hinge.

5. What is meant by length of the hinge?

The value of moment at the adjacent section of the yielded zone are more than the yield moment My upto a certain length of the structure member, this length is known as the length of the hinge.

6.Define region of yield or plasticity?

The length of the hinge depends upon the type of loading and the geomentry of the cross section of the structural member. This region of length of hinge is known as region of yield or plasticity.

7.mention the two computer programmes have been written?

ALSSB, BLSSB

8.Define purlins?

In the roof trusses horizontal beams spanning between the two adjacent trusses are known as purlins.

9.Define lintels?

The beams resting on the purlins are known as common rafter or simply rafters. In the buildings the beams spannings over the doors, windows and other openings in the walls are known as lintels.

10.what is spandrel beams?

The beams at the outside wall of a building supporting its share of the floor and also the wall upto the floor above it are known as spandrel beams.

11. Define stringer?

The beams supporting the stair steps are called stringers.

PART - B

1.A Simply supported in both planes of 6m effective span is subjected to biaxial bending forces (i) a vertical concentrated force if 65 kN at mid span and (ii)a lateral concentrated force of 8kN at mid span. Design the beam using rolled beam sections.?

2. A welded plate girder has (i) each top and bottom flange =435 x 28 mm and (ii) web=1250x10mm. Design vertical and horizontal stiffeners?

3.Design a beam of effective span 6m and subjected to a bending moment of 105 x10^6Nmm for the condition that the compression flange is laterally unsupported throughout?

4. Design a welded platte girder 24m in effective span and simply supported at the two ends. It carries a uniformly distributed load of 100kN/m. Check the stresses and design striffener.

UNIT- V

PART – A

1.Define roof trusses?

Truss girders are the frame works which usually comprise of straight struts and ties and sometimes both in response to moving loads.

2.mention the types of roof trusses?

King post
Queen post
Home truss
Pratt truss
Fink or French roof trusses
Compound French truss
Cambered French roof truss
Quadrangular truss.

3.Define top chord ?

The top chord defined as the uppermost line of members extending from one support to the other and that passes through the peak of a truss. The top chord is also known as the upper chord of the truss.

4. Define span?

The span of a roof truss is defined as the distance centre to centre of supports. The span of a roof trusses is decided by the dimensions of area to be kept free of columns.

5.What is meant by rafters?

The rafters are beams and rest on the purlins. The rafters support the sheathing. The may support sub-purlins directly. These are called common rafters to distinguish from principal rafter.

6.Define eaves?

The bottom edge of an inclined roof surface or a pitch roof is termed as eaves.

7. What is the weight of purlins?

The weight of purlins is assumed as 0.070 to0.150 KN per square meter of plan area.

8.Define glass sheet?

The glass sheets are manufactured in various size and thickness. The glass sheets are mainly used for light from sloping roof.

9.What is meant by bottom chord?

The bottom chord is defined as the lower most lilne of members of truss extending from one support to the other. The bottom chord is also known as the lower chord of the roof truss.

10.Define panel ?

The panel is defined as a distance between two adjacent joints in a principal rafter of a roof truss. It is also defined as the distance between the two adjacent purlins.

11. Define is bay?

The bay is defined as the distance between the adjacent trusses.

Part- B

1.Design a purlin for a roof truss having the following data
Span to truss = 6m
Spacing of truss=3m centre to centre
Inclination of roof = 30
Spacing of purlins = 2m centre to centre
Wind pressure = 1.5 kN/m2
Roof coverage = A.C. sheets weighing 200N/m2
Provide channel section purlin.

2.Design a gantry girder to be used in an industrial building carrying an electric overhead travelling crane, for the following data.
Crane capacity =200kN
Self wt of the crane girder excluding trolley = 200kN
Self Wt of the trolley electric motor hook, Etc = 300kN
Approximate minimum approach of the hook to the gantry =1.2
Wheel base = 3.5 m
c/c distance between gantry rails =10m
c/c distance between column =8m
self wt of rail section=30kN
yield stress of steel = 250N/m2

3.Design a purllin for the following data
Spacing of roof trusses – 4m
Spacing of purlins – 1.4m
Pitch of roof – ¼
Weight of gI sheeting – 133 N/m2
Wind load intensity normal to roof – 1500N/M2
Use channel section.