

# Design of Steel Structures

## Question Bank

### Unit 1

1) A load of 150 kN is applied to a bracket plate at an eccentricity of 300 mm. sixteen rivets of 20 mm nominal diameter are arranged in two rows with 8 rivets per row. The two rows are 200 mm apart and the pitch is 80 mm. if the bracket plate is 12.5 mm thick, investigate the safety of the connection. Given,  $s = 100 \text{ N / mm}^2$  ,  $f_b = 300 \text{ N / mm}^2$  and  $f_t = 150 \text{ N / mm}^2$  .

2) Two plates 12 mm and 10 mm thick are joined by a triple riveted lap joint, in which the pitch of the central row of rivets is 0.6 times the pitch of rivets in the outer rows. Design the joint and find its efficiency. Take  $\sigma_{at} = 150 \text{ N/mm}^2$  &  $\sigma_{pf} = 250 \text{ N/mm}^2$  . (May / June 2007)

3) 1) A doubly reinforced rectangular beam is 300mm wide and 500mm deep to the centre of tension steel.it is reinforced with four bars of 18mm diameter as compressive steel at an effective cover of 40mm and with four bars of 20mm diameter as tensile steel.if the stresses in concrete and steel are not to exceed  $7 \text{ n/mm}^2$  and  $230 \text{ n/mm}^2$  respectively,find the moment of resistance of the section.Take  $m=13.33$   
adopt revised elastic theory

4) A doubly reinforced rectangular beam is 300mm wide and 500mm deep to the centre of tension steel.it is reinforced with four bars of 20mm diameter as compressive steel at an effective cover of 40mm and with four bars of 25mm diameter as tensile steel.if the stresses in concrete and steel are not to exceed  $7 \text{ n/mm}^2$  and  $230 \text{ n/mm}^2$  respectively,find the moment of resistance of the section.Take  $m=13.33$   
adopt revised elastic theory

5) A reinforced concrete section is subjected to a bending moment of 150kNm which may be positive or negative.if the permissible stresses in concrete and steel are  $7 \text{ N/mm}^2$  and  $230 \text{ N/mm}^2$  and  $m=13.33$  .design the section

6) What do you mean by equivalent concrete area of a reinforced concrete member?

7) What are the basic assumptions in the analysis of reinforced concrete members?

8) A 300mm\*300mm R.C. member reinforced with 2032mm square of steel supports an axial compression load of 750kn.calculate the stresses in concrete and steel. Take  $m=18$

9) A doubly reinforced rectangular beam is 250mm wide and 550mm deep to the centre of tension steel.it is reinforced with four bars of 16mm diameter as compressive steel at an effective cover of 40mm and with four bars of 20mm diameter as tensile steel.if the stresses in concrete and steel are not to exceed  $7 \text{ n/mm}^2$  and  $230 \text{ n/mm}^2$  respectively,find the moment of resistance of the section.Take  $m=13.33$   
adopt revised elastic theory

10) A singly reinforced beam 250mm wide and 380mm deep to the centre of reinforcement is reinforced

## Unit 2

1. Explain the parts of door and window in brief.
  2. Explain different type of door with neat diagram.
  3. Explain the parts of a staircase with suitable diagram.
  4. Explain different type of staircase with suitable diagram.
  5. What is floor .Explain various type of floor with relative suitability?
  6. What is difference between sliding and collapsible door.
  7. Explain general consideration for staircase.
  8. What are functional requirement for the design and construction of door and window?
9. Write down the general rule of natural ventilation.
10. Write the various mechanical ventilation.
11. Explain mechanical lifter and various part of it .

## Unit 3

1. Determine the strength of a double cover butt joint used to connect two flats 200 F 12. The thickness of each cover plate is 8 mm. flats have been joined by 9 rivets in chain riveting at a gauge of 60 mm. What is the efficiency of the joint?
2. A load of 150 kN is applied to a bracket plate at an eccentricity of 300 mm. sixteen rivets of 20 mm nominal diameter are arranged in two rows with 8 rivets per row. The two rows are 200 mm apart and the pitch is 80 mm. if the bracket plate is 12.5 mm thick, investigate the safety of the connection. Given,  $s = 100 \text{ N / mm}^2$  ,  $f_b = 300 \text{ N / mm}^2$  and  $f_t = 150 \text{ N / mm}^2$  .
3. What are the types of load to be account for steel design?
4. A bridge truss carries an axial pull of 400 KN. It is to be a gusset plate 22mm thick by a double cover butt joint with 22 mm diameter power driven rivets. Design an economical joint. Determine the efficiency of the joint. 1
5. Two plates 12 mm and 10 mm thick are joined by a triple riveted lap joint, in which the pitch of the central row of rivets is 0.6 times the pitch of rivets in the outer rows. Design the joint and find its efficiency. Take  $\sigma_{at} = 150 \text{ N/mm}^2$  &  $\sigma_{pf} = 250 \text{ N/mm}^2$  . (May / June 2007)

#### Unit 4

1. Determine the strength of a double cover butt joint used to connect two flats 200 F 12. The thickness of each cover plate is 8 mm. flats have been joined by 9 rivets in chain riveting at a gauge of 60 mm. What is the efficiency of the joint?
2. A load of 150 kN is applied to a bracket plate at an eccentricity of 300 mm. sixteen rivets of 20 mm nominal diameter are arranged in two rows with 8 rivets per row. The two rows are 200 mm apart and the pitch is 80 mm. if the bracket plate is 12.5 mm thick, investigate the safety of the connection. Given,  $s = 100 \text{ N / mm}^2$  ,  $f_b = 300 \text{ N / mm}^2$  and  $f_t = 150 \text{ N / mm}^2$  .
3. What are the types of load to be account for steel design?
4. A bridge truss carries an axial pull of 400 KN. It is to be a gusset plate 22mm thick by a double cover butt joint with 22 mm diameter power driven rivets. Design an economical joint. Determine the efficiency of the joint. 1
5. Two plates 12 mm and 10 mm thick are joined by a triple riveted lap joint, in which the pitch of the central row of rivets is 0.6 times the pitch of rivets in the outer rows. Design the joint and find its efficiency. Take  $\sigma_{at} = 150 \text{ N/mm}^2$  &  $\sigma_{pf} = 250 \text{ N/mm}^2$  .
6. A bracket carrying a load of 100 kN is connected to column by means of two horizontal fillet welds, of 130 mm effective length and 10 mm thick. The load acts at 70 mm from the face of the column as shown. Find the throat stress.
7. A tie member 75 mm X 8mm is to transmit a load of 90 kN. Design the fillet weld and calculate the necessary overlap.
8. A single bolted double cover butt joint is used to connect two plates 8mm thick. Assuming 20mm bolts at 50mm pitch calculate the efficiency of the joint. The thickness of cover plate is 4mm. 1
9. The figure shows the joint in the bottom chord continuous member of the truss. Design the connection using M16 black bolt of property class 4.6 and grade Fe410 steel. Assume edge distance of 35 mm and minimum pitch.

#### Unit 5

- 1) Explain the butt joint and riveted joint
- 2) Discuss about effective length of steel member.

3) Discuss about compression member and Tension member

4) A doubly reinforced rectangular beam is 300mm wide and 500mm deep to the centre of tension steel.it

Is reinforced with four bars of 20mm diameter as compressive steel at an effective cover of 40mm and With four bars of 25mm diameter as tensile steel. If the stresses in concrete and steel are not to the Exceed  $7\text{n/mm}^2$  and  $230\text{n/mm}^2$  respectively, find the moment of resistance of the section. Take  $m=13.33$

5) What are the basic assumptions in Design of steel structures?

6) A bridge truss carries an axial pull of 400 kN. It is to be a gusset plate 22mm thick by a double cover butt joint with 22 mm diameter power driven rivets. Design an economical joint. Determine the efficiency of the joint.

7) Discuss about reliability of steel structures.

8). A tie member 15 mm X 8mm is to transmit a load of 100 kN. Design the fillet weld and calculate the necessary overlap

9) What are the types of load to be account for steel design?