UNIT – I

TWO MARK QUSTIONS AND ANSWERS

1. What are the various types of connections used for connecting the structural members?

- Riveted connections
- Bolted connections
- Pin connections
- Welded connections

2. Define nominal diameter of rivet.

It is the diameter of the unheated rivet measured before driving. It is the stated diameter of the rivet, available in the market.

3. Define gross diameter of rivet.

It is the diameter of the rivet in the hole, measured after driving. It is taken equal to the diameter of the rivet hole.

4. What is meant by gauge distance and edge distance?

Gauge distance is the perpendicular distance between two adjacent gauge lines. This is also called as back pitch.

Edge distance is the distance of the edge of the member or the cover plates from the centre of extreme rivet hole.

5. Define staggered pitch.

It is also called as alternate pitch or reeled pitch. The staggered pitch is defined as the distance measured along one rivet line from the centre of a rivet to the centre of the adjoining rivet on the adjacent parallel rivet line.

6. What is meant by tensile stress?

When a structural member is subjected to direct axial tensile load, the stress is known as tensile stress (σ_{at}). The tensile stress is calculated on net cross-sectional area of the member.

$$\sigma_{at} = (P_t / A_n)$$

Where, P_t is the direct axial tensile load and A_n is the net cross-sectional area of the member.

7. What is meant by compressive stress?

When a structural member is subjected to direct axial compressive load, the stress is known as compressive stress (σ_{ac}). The compressive stress is calculated on gross cross-sectional area of the member.

$$\sigma_{ac} = (P_c / A_g)$$

Where, P_c is the direct axial compressive load and A_g is the gross-sectional area of the member.

8. Define bearing stress.

When a load is exerted or transferred by the application of load through one surface for another surface in contact, the stress is known as bearing stress (σ_p). the bearing stress is calculated on net projected area of contact.

$$\sigma_p = (P / A)$$

Where, P = load placed on the bearing surface.

A = net projected area of contact.

9. What is working stress?

The working stress is also termed as allowable stress or permissible stress. The working stress is evaluated by dividing yield stress by factor of safety. For the purpose of computing safe load carrying of a structural member, its strength is expressed in terms of working stress. The actual stresses resulting in a structural member from design loads should not exceed working stress.

10. What are the methods employed for the design of the steel framework?

- Simple design
- Semi-rigid design
- Fully rigid design
- Plastic design.

11. What are the assumptions made in simple design?

- The beams are simply supported.
- All connections of beams, girders, or truss are virtually flexible and are proportioned for the reaction shears applied at the appropriate eccentricity

- The members in compression are subjected to forces applied at the appropriate eccentricities.
- The members in tension are subjected to longitudinal forces applied over the net area of the sections.

12. Define Poisson's Ratio.

The Poisson's ratio is defined as the ratio of transverse strain to the longitudinal strain under an axial load. It is denoted by 'μ' or 1/m. the value of Poisson's ratio for steel within the elastic region ranges from 0.25 to 0.33.

13. What are the types of riveted joints?

i. Lap joint
   (a) Single riveted lap joint
   (b) Double riveted lap joint

ii. Butt joint
   (a) Single cover butt joint
   (b) Double cover butt joint

14. What are the types of failures occur in riveted joint?

- Shear failure of rivets
- Shear failure of plates
- Tearing failure of rivets
- Bearing failure of plates
- Splitting failure of plates at the edges
- Bearing failure of rivets.

15. What are the assumptions made for designing riveted joint?

- The load is assumed to be uniformly distributed among all the rivets.
- The shear stress on a rivet is assumed to be uniformly distributed over its gross area.
- The bearing stress is assumed to be uniform between the contact surfaces of plate and rivet.
- The bending stress in a rivet is neglected.
- The rivet hole is assumed to be completely filled by the rivet
- The stress in plate is assumed to be neglected.

- The friction between plates is neglected.

16. Write about minimum pitch and maximum pitch.

Minimum pitch: The distance between centres of adjacent rivets should not be less than 2.5 times the gross diameter of the rivet.

Maximum pitch:

- The maximum pitch should not exceed 12t or 200 mm whichever is less in case of compression member, and 16t or 300 mm whichever is less in case of tension member.
- The distance between centres of any two consecutive rivets in a line adjacent and parallel to an edge of an outside plate shall not exceed (100mm + 4t) or 200 mm, whichever is less in compression or tension members.
- If the line of rivets (including tacking rivets) does lie in the direction of stress, the maximum pitch should not exceed 32 t or 300 mm whichever is less, where t is the thickness of the thinner outside plate.

17.What is edge distance?

A minimum edge distance of approximately 1.5 times the gross diameter of the rivet measured from the centre of the rivet hole is provided in the rivet joint.

18. What are the advantages of bolted connections?

- There is silence in preparing bolted connection. In riveting, hammering is done. The hammering causes noise in the riveting.
- There is no risk of fire in bolted connection. The rivets are made red hot in riveting and there is risk of fire.
- The bolted connections may be done quickly in comparison to the riveting.
- Though the cost of bolts is more than the cost of rivets, the bolted connections are economical to use because less persons are required for installation, and the work proceeds quickly

19***. What are the various types of bolts used for structural purposes?***

- Unfinished bolts
- Turned bolts
- High strength bolts

20. Write about the advantages of welding.

- There is silence in the process of welding.
- There is safety of welding operator in the welding.
- The welding may be done quickly in comparison to the riveting.
- The welded joints have better appearance than riveted joints.
- The welded joints are more rigid than the riveted joints

21. List the various types of welded joints.

- Butt weld
- Fillet weld
- Slot weld and plug weld
- Spot weld
- Seam weld
- Pipe weld

22. Write about the disadvantages of welding.

- The members are likely to distort in the process of welding.
- A welded joint fails earlier than riveted joint, if the structure is under fatigue stresses.
- There is a greater possibility of brittle fracture in welding than the rivet.
- The inspection of welded joint is more difficult and more expensive than the riveted joint.
- More skilled person is required in the welding than in the riveting.

23. What is the effective area of butt weld?

The effective area of a butt weld is taken as the product of the effective throat thickness and the effective length of butt weld.

24. How the length of bolt is calculated?

The length of bolt is equal to the distance from the underside of the bolt head to the extreme end of the shank, including any camber or radius.

16 MARK QUESTIONS

1. A double riveted double cover butt joint is used to connect plates 12 mm thick. Using Unwin's formula, determine the diameter of rivet; rivet value, gauge and efficiency of joint. Adopt the following stresses:
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)
Working stress in axial tension in plates = 0.6 f_y

2. Determine the strength of a double cover butt 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? Adopt working stresses in rivets and flats as per IS: 800 – 1984.

3. 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 N / mm^2,
f_b = 300 N / mm^2 and f_t = 150 N / mm^2.

4. What are the types of load to be account for steel design?

5. 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.