

UNIT-1: FUNDAMENTAL OF STEEL STRUCTURES

QUESTION 1. Write two advantages and two disadvantages of steel as a
Construction material.

(Sum-24,09-05-2024 Marks-2) (Sum-23,20-05-2023 Marks-2) (Sum-22, 11-06-2022 Marks-4)

ANS: Advantages of steel as construction material:

- 1) Steel has good mechanical properties like malleability and ductility with high strength
- 2) Steel structure is highly suitable for prefabrication and mass production
- 3) It has high scrap value
- 4) It can be erected quite rapidly
- 5) Suitable for gas resistance structures
- 6) It is very useful for large span bridges, tall structures. Etc.
- 7) It can be easily fabricated to any desired shape and size
- 8) It has high ratio of strength to weight which makes it to resist high load over a small cross section

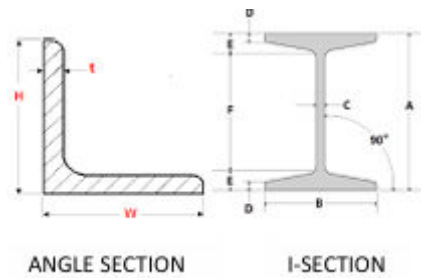
Disadvantages of steel as construction material:

- 1) Steel is very costlier material.
- 2) It has affinity of corrosion and hence requires corrosion treatment periodically.
- 3) It requires skill labour for erection
- 4) It creates noise and requires electricity during connection of members.
- 5) In steel construction it should not be monolithic construction

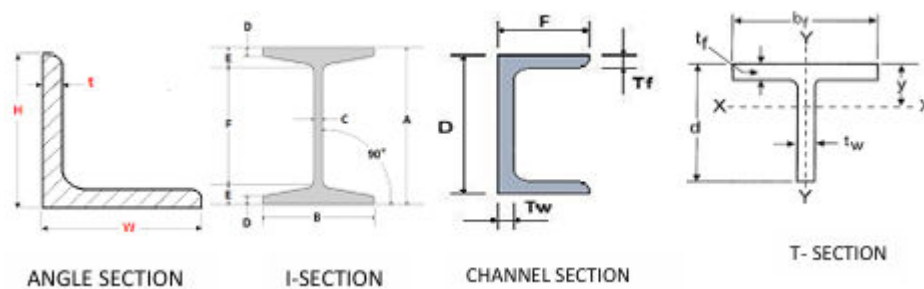
QUESTION 2. State any four structures where steel rolled sections are used.
Also draw any two rolled section. (Sum-23, 20-05-2023 Marks-4)

ANS: List of steel structure

- | | | |
|-------------------------------|----------------------|-------------------|
| 1. Communication towers. | 2. Steel water tanks | 3. Steel bridges. |
| 4. Gantry girders and cranes. | 5. Steel columns | 6. Steel Chimney |



QUESTION 3. State any four types of structural steel sections along with Sketches. (Win-23,5-12-2023 Marks-4)



QUESTION 4. Enlist four steel structures with their functions.

(Sum-22, 11-06-2022 Marks-2)

- ANS: 1. Steel tower: a) Lightning tower: It is used to prevent or to reduce lightning strike damage to the structure
 b) Transmission tower: It is used to support high tension cable.
2. Roof trusses: A roof truss is used to support purlins and roof over it. It is used in Industries for large span working space.
3. Steel water tank: Steel tank are used to store of water, oil or any other liquids and Gases Different in shapes like rectangular, circular or spherical
4. Steel bridges: Steel bridges are generally used in railways to cross highways, rivers And valley etc.
5. Crane girders: Crane girders are used in large scale industries to lift and move heavy materials and machinery
6. Steel chimney: Steel chimney are used for emission of flue gases higher in the atmosphere and reduce pollution.

QUESTION 5. State for benefits when steel is used as a construction material.

Also list any four steel structures along with their function.

(Win-22, 09-01-2023 Marks-4)

ANS: 1) The steel member can resist high load with comparatively light weight and small size of member

2) Extensively useful for large span industrial steel bridges, Tower and communication networks, steel overhead tanks

3) Steel has many good mech. Properties like ductility and malleability

4) It is good for earthquake resistant structure due to more ductile nature.

5) It gives high scrap value

6) It is easy to fabricate by bolting or welding to any desired shape.

7) The steel member are gas and water tight

8) The steel member have long service life

9) It bears tension, compression, shear, bending and torsional forces

10) The steel structures may be inspected quickly and conveniently

11) Steel as construction material can be recycled easily (reuse)

1. Steel tower: a) Lightening tower: It is used to prevent or to reduce lightning strike damage to the structure

b) Transmission tower: It is used to support high tension cable.

2. Roof trusses: A roof truss is used to support purlins and roof over it. It is used in Industries for large span working space.

3. Steel water tank: Steel tank are used to store of water, oil or any other liquids and Gases Different in shapes like rectangular, circular or spherical

4. Steel bridges: Steel bridges are generally used in railways to cross highways, rivers And valley etc.

QUESTION 6. Enlist the components and corresponding functions of steel

Water tank. (Win-2019, 18-11-2019 Marks-2).

ANS: The components of a steel water tank are:-

The side wall plates Bottom wall plates, bracings in case of rectangular tanks Elevated steel tank consists of, Ring beam, Staircase.

The primary functions of a steel water tank is storage of water ,oil or any other liquids and gases.

QUESTION 7. State the full form of ISJB, ISA, ISMC, and ISNT

(Sum-24,09-05-2024 Marks-2)

ANS: ISJB-Indian Standard Junior Beam ISA- Indian Standard Angle section
ISMC- Indian Standard medium Channel ISNT- Indian Standard Normal
TEE Bars

QUESTION8. State types of loads to be considered while designing the steel Structures with respective IS Codes.

(Win-23, 5-12-2023 Marks-2), (Win-22, 09-01-2023 Marks-2) (Win-2019, 18-11-2019 Marks-2).

ANS: 1. Dead load – IS875:1987 Part-I

2. Live load - IS875:1987 Part-II

3. Wind load - IS875:1987 Part-III

4. Snow load - IS875:1987 Part-IV

5. Load due to Seismic force- IS 1893:2002 & IS875:1987 Part-V

QUESTION 9. Define partial safety factor and state its type.

(Sum-22, 11-06-2022 Marks-2)

Ans: The load factor and material factored are contribute partially to safety so they are called as partial safety factors.

Two types of partial safety factor are:

1. Partial safety factor for load
2. Partial safety factor for material strength

QUESTION 10. Define partial safety factor and write its values for load and Material. (Sum-23, 20-05-2023 Marks-2)

ANS: The load factor and material factored are contribute partially to safety so they are Called as partial safety factors.

The values of partial factor of safety for steel and concrete.

- 1) Partial factor of safety for steel = 1.15
- 2) Partial factor of safety for concrete = 1.5

QUESTION 11. State the values of partial safety factors for material strength of Concrete and steel for limit state of collapse.

(Sum-24,09-05-2024 Marks-2) (Win-2019, 18-11-2019 Marks-2).

ANS: The values of partial factor of safety for steel and concrete.

- 1) Partial factor of safety for steel = 1.15
- 2) Partial factor of safety for concrete = 1.5

QUESTION12. Write the justification to the safety factor which is used in limit State design is referred as a partial factor of safety.

(Win-22, 09-01-2023 Marks-2)

ANS: Since the safety of principal design factors (viz. load and material strengths) which are not dependent on each other, two different safety factors, one for load and other for material strength are used. Because each of two factors contributes partially to safety, they are termed as partial safety factors.

QUESTION 13. Explain the limit state of serviceability applicable to steel

Structures. (Win-2019, 18-11-2019 Marks-4).

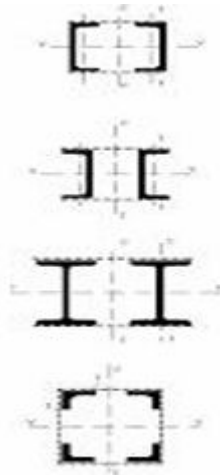
ANS: The acceptable limit for safety and serviceability of the structure before failure Occurs is called as Limit state. To assure the serviceability of the structure through out its lifetime, it is related to the satisfactory performance of the structure at Working load.

The following limit state of serviceability is considered:

- 1) Deflection and deformation
- 2) Durability
- 3) crack due to fatigue
- 4) Fire

QUESTION 14. Draw four type built up section forms of compression members

(Sum-2018, Marks-4 G-Scheme).



QUESTION 15. List any four common standard types of steel sections used

with their applications. (Sum-2018, Marks-4 G-Scheme).

ANS: I-SECTION : I Sections are used as a beam and column in steel structure.

CHANNEL SECTION: Channels section are used for a column in steel structures.

ANGLE SECTION : Angle sections are used as tension and compression members for steel structures

T- SECTION : T-section are used for various steel structural members.