FAQs

1. **Define the term: Limit state.**

   The acceptable limit for safety and serviceability of structure before failure occurs is called limit state.

2. **What are limit states?**

   There are two limit states:

   - Limit state of collapse – flexure, shear, torsion and compression
   - Limit state of serviceability – deflection and cracking

3. **Define the term: Characteristic strength of materials.**

   Characteristic strength of material is the strength of materials below which not more than 5% of the test results are expected to fail.

4. **What do you mean by characteristic load?**

   It means that value of load, which has a 95 percent of not being exceeded during the life time of the structure.

5. **What are the partial safety factor for concrete and steel used in limit state method?**

   Partial safety factor for Concrete : 1.5

   Partial safety factor for steel : 1.15

6. **What are the assumptions made in limit state method of collapse – flexure?**

   - Plane sections normal to the axis remain plane after bending.
   - The maximum strain in concrete at the outermost compression fibre is taken as 0.0035 in bending.
   - The relationship between the compressive stress distribution in concrete and the strain in concrete may be assumed to be rectangle, trapezoid, parabola or any other shape, which results in prediction of strength in substantial agreement with the results of test. An acceptable stress-strain curve is given in Fig. 21 of IS 456:2000. For design purposes, the compressive strength of concrete in the structure shall be assumed to be 0.67 times the characteristic strength. The partial safety factor Y_m = 1.5 shall be applied in addition to this.
   - The tensile strength of the concrete is ignored.
   - The stresses in the reinforcement are derived from representative stress-strain curve for the type of steel used. Typical curves are given in Fig. 23 of IS 456:2000. For design purposes the partial safety factor Y_m, equal to 1.15 shall be applied.
   - The maximum strain in the tension reinforcement in the section at failure shall not be less than:

     $f_y/1.15E_s + 0.002$

where, f_y = characteristic strength of steel, and E_s = modulus of elasticity of steel.