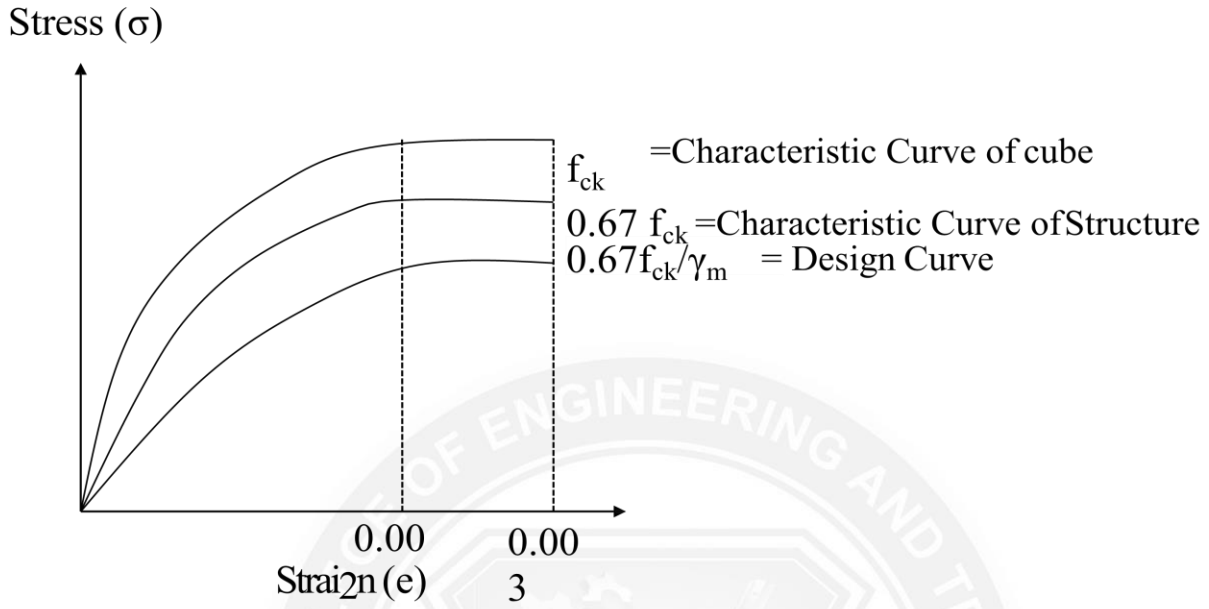
4.5 STRESS-STRAIN CURVE FOR CONCRETE



- The Figure showing the stress – strain curve for concrete. Usually, the curve may be assumed to be rectangular, trapezoidal, parabola or any other shape.
- The curve will be linear in lower grade of concrete and nonlinear in higher grade of concrete.
- The reason for this nonlinear behavior is that micro cracks are formed,
    i. At the interface between aggregate particles and cement paste as a result of the differential movement between the two phases, and
    ii. Within the cement paste itself.
- These cracks are formed as a result of change in temperature and moisture and the application of load.
- Concrete taken through a cycle of loading and unloading will exhibit a stress-strain curve as shown in the figure.
- 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 γ_m, = 1.5 shall be applied in addition to this.

- While studying the stress-strain relationship, tensile strength of the concrete is ignored.
- The concrete will not return to its original length when unloading mainly due to creep and micro-crackling.
- There will be a residual strain at zero loads. This is known as hysteresis loop.
- Hysteresis loop is mainly related to micro-cracking.
- Providing the maximum applied load is not greater than the normal working load, and then further cycles of loading and unloading will produce small size hysteresis loops.
- This because the majority of the micro-cracks are formed on the first application of the load.