IS-CODE PROVISIONS FOR DESIGN OF BEAMS:

1. The loading on the beam is taken as per clause 24.5 of IS 456-2000
2. For continuous beam with equal/unequal spans and equal/unequal loaded, the bending moment is obtained by using kanis method.
3. Effective span and effective depth of beam is same as explained in slab provisions.
4. The beams at mid span are designed as T-beams and the same steel reinforcement is provided for all beams and the reinforcement provided are minimum.
5. At supports when the moment of resistance exceeds the balancing moment the section is designed as double reinforced section.
6. Minimum reinforcement in the tension shall not be less then

   $A_{st} / Bd = 0.85 / f_y$
7. Max. Rein. In tension shall not be exceeded by 0.04 bD…Clause 26.5.1.
8. Max. Area of compression reinf. Shall not exceed 0.004 bd

   And reinf. Is enclosed by strength vide. ……Clause 26.5.1.2.
9. Nominal shear stress for uniform depth shall be calculated from

   The equation. $\tau_v = v_u/bd$. ……. Clause 40.1
10. Min. shear reinf. Will be provided when $\tau_v < \tau_c$ given in table 19 of Is code.
11. Max. Spacing of shear reinf. Shall not exceed the least of 0.75d

    or 300mm for vertical stirrups …… clause 26.5.1.5.
12. Shear reinf. Shall be provided to carry a shear equal to Vu - bd.

    The strength of shear reinf. V_s shall be calculated for vertical stirrups.

    $V_s = 0.87 f_y A_{sv} d / S_v$. …. Clause 26.2.3.3.
13. At least 1/3rd positive moment reinf. In simple beam and 1/4th positive moment reinf. In continuous beam shall extend along the same face of the

    Member into the support to a length equal to Ld/3…… clause 26.2.3.3
14. For curtailment, reinf. Shall extend beyond the point at which it is no longer require to resist flexure for a distance equal to the effective depth of the member or 12 times the dia. Of the bar whichever is greater. ……Clause 26.2.3.1.
15. The minimum shear reinforcement in the form of stirrups shall be provided such that

    $A_{sv}/bs_v \geq 0.4/0.8f_y$……. Clause 26.5.1.6.

    A_{sv} = Total c/s. area of strips legs Effective in shear.

    S_v = Stirrups spacing along the length of the member.

    b = Breadth of the beam or breadth of flanged beam

16. Clear cover for longitudinal reinforcement in a beam should be neither less than 25mm nor less than dia of such bar and 15mm to stirrups
17. At each end the cover of the reinforcing bar neither less than 25mm nor less than twice the dia of such bar.
18. At least two bars should be used as tension steel and not more than 6 bars should be in one layer of beam.
19. The diameter of hanger bar shall not be less than 10mm and of main tension bars 12mm. The usual dia of bar chosen for beams are 10, 12, 16, 20, 22, 25 & 32mm. When using different sized bars in one layer place the largest dia bar near the faces, there as of steel should be symmetrical about centerline of column as for as possible.
20. The max. Distance between bars has the dia. Of bar or max. Size of aggregate plus 5 mm size. Size of aggregate normally used in India is 20 mm. So that clears max. Distance between bar should be 25 mm.
21. The depth of beam should satisfy the deflection requirements with respect to L/D ratios in addition for economy. The ratio of overall depth to, which should be between1.5 to 2.0.
22. Specifications regarding spacing of stirrups in double reinforced beams:

    Compression steel placed in double reinforced beam also has to

    Beam restrained against local buckling during its action like the compression steel the same rules regarding restraining of column reinforcements by lateral ties applied to compression reinforcement in beams also. Accordingly, the dia. Of strips should be 6mm and the pitch should not be more than the least of the following:

    a. Least lateral dimension.
    b. 16 x dia. of longitudinal bar.
    c. 300 mm

23. Minimum steel is necessary to
    1. Guard against any sudden failure of a beam in concrete cover
       burst and the bond to the tension steel is lost.
    2. Prevent brittle failure which can occur without shear steel.
    3. Prevent failure that can be caused by tension due to shrinkage
       And thermal stress and internal crooking in the beams
    4. Holds the reinforcements in place while pouring concrete and acts as the
       necessary ties for the compression steel and make them effective.