DEPARTMENT OF CIVIL ENGINEERING

ITER, SoA University

Reinforced Concrete Design (CVL4121)
Minor Assignment 6
Deadline - 4 March 2017 Midnight

Part-1

Design 2-legged shear reinforcement for beam given in **Minor Assignment 5**

Go according to points given below. Use IS456:2000 for given points.

- Refer Clause 40 for complete reference on shear reinforcement for limit state of collapse.
- Calculate τ_v according to figure 2.
  Note- You can also over-design by taking shear at supports.
- Check if this case requires shear reinforcement design or minimum shear reinforcement or redesign of the section.
- Based on above point, use clause 40.3 or 40.4.
- Refer section 6.7 of textbook on 2-legged area calculation.
- Provide spacing of stirrups according to clause 26.5.1.5.
- Draw and detail your design for shear reinforcement.

Part-2

Design one way slab simply supported on $230mm$ thick walls having $5m$ clear distance between them, exposed to moderate condition. The slab will carry self weight and a distributed dead load of $5kN/m^2$. Assume Fe415 steel.

Go according to points given below. Use IS456:2000 for given points. Also refer Example 5.2 of textbook.

- Specify exposure condition given in question from Table-3 and find grade of concrete from Table-5.
- Find effective span from clause 22.2.
- Find effective depth from span to depth ratio as given in clause 23.2.1.
- Find minimum clear cover from Table-16 (exposure condition) and Table-16A (fire resistance).
- Assume initial guess for reinforcements and stirrups to be used and find total depth.

- From above depth find width of beam about half of total beam depth (in multiple of $50mm$), refer paragraph 5.3.1 of textbook.
- Find design loads and moments according to Table-18.
- Find limiting effective depth (d_{lim}) of concrete based on $M_u = kf_{ck}bd^2$. find k according to grade of steel.
- Check d to be well above d_{lim} as found above and recalculate D to be a multiple of $10mm$.
- Find $(A_{st})_{reqd}$ from $\frac{M_u}{bd^2} = 0.87f_y\frac{p_t}{100}[1 - \frac{p_t f_y}{100 f_{ck}}]$. Provide A_{st} a little more than required. Choose main and distribution steel bars from $\phi5, \phi6, \phi7, \phi8, \phi10, \phi12, \phi16, \phi18, \phi20, \phi22, \phi25, \phi28, \phi32, \phi36, \phi40, \phi45, \phi50$.
- Provide distribution bars according to clause 26.5.2.1.
- Provide spacing based on clause 26.3.3.
- Check maximum diameter of bar from 26.5.2.2.
- Check if it is in minimum and maximum reinforcement limit from clause 26.5.1.1.
- Check if section is not over-reinforced i.e. $(A_{st})_{bal} > (A_{st})_{provided}$ (You can find$(A_{st})_{bal}$ from $C_{bal} = T_{bal}$).
- Check if the clear distances between bars and concrete surfaces is according to clause 26.3.2.
- Reconfirm the allowable moment capacity of designed section to be more than design moment.
- Check for deflection control from Figure 4 and 5 from code.
- Refer Clause 40 for complete reference on shear reinforcement for limit state of collapse.
- Calculate τ_v according to figure 2.
  Note- You can also over-design by taking shear at supports.
- Check if this case requires shear reinforcement design or minimum shear reinforcement or redesign of the section.
- Draw and detail your section according to above points and clause D-1.6 (Annex-D).

Submission Link