FAQs

1. **Give the moment coefficients for bending moment calculations as per IS 456:2000**

Type of load	Span Moments		Support Moments	
	Near the middle of end span	At middle of interior span	At support next to the end support	At other interior supports
Dead load and imposed load (fixed)	+1/12	+1/16	- 1/10	- 1/12
Imposed load (not fixed)	+1/10	+1/12	- 1/9	- 1/9
For obtaining BM, the coefficient shall be multiplied by the total design load and effective span				

2. **Design a three span one way continuous roof slab for a residential building of effective span 3m. It carries a live load of 1.5 kN/m² and weathering course and tile of 1.0 kN/m². Adopt M20 concrete & Fe415 steel. Draw the reinforcement details also.**

   a. Load calculations:

   i. Dead loads:

   Assuming thickness of slab from Cl. 23.2.1

   l/d = 26

   d = 3000/26 = 115.40

   D = 115.40 + 15 + 8/2 = 134.38mm

   Assume D = 125mm

   Self weight of slab = 0.125 x 25 = 3.125 kN/m²

   Weight of weathering course and tiles = 0.025 x 24 = 1.0 kN/m²

   Total dead loads w_d = **4.125 kN/m²**

   ii. Live load on slab w_l = **3.0 kN/m²**

   b. Moment calculations:

   i. Span moments

   Moment near the middle of end span = $w_d l^2/12 + w_l l^2/10$ = 5.79 kNm

   Moment at the middle of interior span = $w_d l^2/10 + w_l l^2/12$ = 4.57 kNm

   ii. Support moments

   Moment at support next to end support = $-w_d l^2/10 - w_l l^2/9$ = - 6.71 kNm

   Moment at other interior supports = $-w_d l^2/12 - w_l l^2/9$ = - 6.09 kNm

   c. Effective depth of slab:

here maximum BM M_d = 6.71 kNm

M_u = 1.5 x 6.71 = 10.065 kNm

by equating M_u to $M_{u,lim}$,

d = 60.39mm < 106mm

Hence safe against moment.

Hence keep D = 125mm; d = 106mm

d. Area of reinforcement – Main Steel

A_{st} for Maximum bending moment

$$M_u = 0.87 f_y A_{st}(d - 0.416 x_u)$$

where $x_u = 0.87 f_y A_{st} / 0.36 f_{ck} b$

$= 0.05\, A_{st}$

Now **$A_{st\,reg}$ = 278.13 mm²**

Check for Minimum steel as per IS 456:2000

A_{st} = 0.12% cross sectional area

= 127.2 mm^2 < 278.13mm^2

Hence $A_{st\,reg}$ = **278.13 mm^2**

Provide 8mm diameter bar

Spacing = 180.73mm

Provide 8mm diameter bar at 160mm c/c

$A_{st\,pro}$ = 314.16mm^2

Distribution Steel

A_{st} = 0.15% cross sectional area

= 159 mm^2

Use 6mm dia ms bar

Spacing = 177.83mm

Provide 6mm dia MS bar at 150mm c/c

e. Check for deflection

As per cl.23.2.1 of IS 456:2000

l/d = 26 x M.F

p_t = 0.30%

$f_s = 0.58 f_y A_{st\,reg} / A_{st\,pro}$ = 213.09 N/mm^2

As per Fig.4 of IS 456: 2000; M.F = 1.6

Hence d = 72.12mm < 106mm

Hence safe against deflection.