FAQs

1. Define the term: Continuous beam

   The beam supported over more than two supports is called as continuous beam.

2. Write the IS codal provisions for using moment coefficients given IS 456:2000 for the design of continuous beam.

   Unless more exact estimates are made, for beams of uniform cross-section which support substantially uniformly distributed loads over three or more spans which do not differ by more than 15 percent of the longest, the bending moments and shear forces used in design may be obtained using the coefficients given Table 12 of IS 456:2000. For moments at supports where two unequal spans meet or in case where the spans are not equally loaded, the average of the two values for the negative moment at the support may be taken for design.

3. 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				

4. Determine the moments and design the size and reinforcement required for a four span continuous beam of effective span 4m subjected to a total live load of 25 kN/m. Use M20 and Fe415 as materials.

   <u>a. Load calculations:</u>

   i. Dead load:

   Assuming size of beam as 230mm x 450mm overall,

   Self weight of beam w_d = 0.23 x 0.45 x 25 = 2.59 kN/m

   ii. Live load on beam w_l = = 25 kN/m

   <u>b. Moment calculations:</u>

   <u>i. Span moments</u>

   Moment near the middle of end span = $w_d l^2/12 + w_l l^2/10$ = 43.45 kNm

   Moment at the middle of interior span = $w_d l^2/10 + w_l l^2/12$ = 35.92 kNm

   <u>ii. Support moments</u>

Moment at support next to end support = $-w_d l^2/10 - w_l l^2/9$ = - 48.58 kNm

Moment at other interior supports = $-w_d l^2/12 - w_l l^2/9$ = - 47.89 kNm

c. Effective depth of beam:

here maximum BM M_d = 48.58 kNm

M_u = 1.5 x 48.58 = 72.87 kNm

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

d = 338.80mm

D = 338.80 + 30 + 20/2 = 378.80mm < 450mm

Hence safe against moment.

Hence keep D = 450mm; d = 450-30-20/2 = 410mm

d. Area of reinforcement

i. A_{st} for M = 43.45 kNm ; M_u = 65.175 kNm

$$\mathbf{M_u = 0.87 f_y A_{st}(d - o.416 x_u)}$$

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

= 0.218 $\mathbf{A_{st}}$

Now $\mathbf{A_{st}}$ = **494.13 mm²**

Provide 3 Nos of 16mm dia bars

ii. A_{st} for M = 35.92 kNm ; M_u = 53.88 kNm

$$\mathbf{M_u = 0.87 f_y A_{st}(d - o.416 x_u)}$$

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

= 0.218 $\mathbf{A_{st}}$

Now $\mathbf{A_{st}}$ = **400.39 mm²**

Provide 2 Nos of 16mm dia bars

iii. A_{st} for M = 48.58 kNm ; M_u = 72.87 kNm

$$\mathbf{M_u = 0.87 f_y A_{st}(d - o.416 x_u)}$$

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

= 0.218 $\mathbf{A_{st}}$

Now $\mathbf{A_{st,\,req}}$ = **563.42 mm²**

Provide 3 Nos of 16mm dia bars

$\mathbf{A_{st,\,pro}}$ = **603.19 mm²**

iv. A_{st} for M = 47.89 kNm ; M_u = 71.84 kNm

$$\mathbf{M_u = 0.87 f_y A_{st}(d - o.416 x_u)}$$

where x_u = $\mathbf{0.87f_yA_{st} / 0.36f_{ck}b}$

= $0.218\ \mathbf{A_{st}}$

Now $\mathbf{A_{st}}$ **= 551.68 mm²**

Provide 3 Nos of 16mm dia bars

<u>e. Check for deflection</u>

l/d = 26 x M.F

p_t = 0.64%

f_s = 224.83 N/mm^2

M.F = 1.2

Now d = 128.21mm < 410mm; hence safe against deflection.