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IAT 3

Sub:	Design Of RC Structural Elements							Code:	18CV53
Date:	25/ 1 / 2022	Duration:	90 mins	Max Marks:	50	Sem:	5	Branch:	CIVIL

Note:Answer all question (Assume any missing data). IS456 and SP:16 code Book permitted

		Marks	OBE	
			CO	RBT
1	Design a rectangular beam of section 230mmX600mm of effective span 6m. Effective cover for reinforcement should be kept as 50mm both compression and tension side. Imposed load on the beam is 40kN/m. Use M20 concrete and Fe 415 steel. Sketch the details of reinforcement. (assume Simply supported Beam)	[20]	CO3	L2
2	Design a slab for a room of clear internal dimensions 3mX5m supported on wall of 300mm thickness, with corner held down. Two adjacent edges of the slab are continuous and other two discontinuous. Live load on the slab is 3kN/m^2. Assume floor finish of 1kN/m^2.Use M20 concrete and Fe 415 steel. Sketch the details of reinforcement.	[20]	CO4	L2
3	An RCC short column of size 400X500mm is carrying factored load of 3000KN. Design the column assuming e_{min} < 0.05D. Use M25 concrete and Fe415 steel.	[10]	CO5	L2

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DRCS

IAT -3 Solution

① $b = 230mm$

$D = 600\ mm$

$l_{eff} = 6m$

Load calculation

Dead load $= 0.23 \times 0.6 \times 25$

Imposed $= 40$

$\therefore \quad W = 43.45\ kN/m$

- Factored load $= 43.45 \times 1.5$

$= 65.17\ kN/M$

- Bending moment, $M_u = \frac{Wl^2}{8} = 293.2\ kN\,m$

$V_u = \frac{W_u l}{2} = 195.5\ kN/m$

- calculation of A_{st}

$M_u - M_{u\,lim} = F_{sc}\ A_{sc}\ (d - d')$

$M_{u\,lim} = 0.36 \frac{x_{u\,max}}{d}\left(1 - 0.42 \frac{x_{u\,max}}{d}\right) bd^2 f_{ck}$

$= 228.46 \times 10^6\ N/m$

$\therefore \quad A_{st} = 651.84 \text{ mm}^2$

$A_{st1} = 1210.8 \text{ mm}^2$

$A_{st2} = 359.05 \text{ mm}^2$

Provide, 4 numbers of 25mm dia

Design of shear.

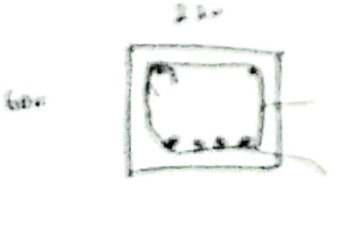
$$\tau_v = \frac{V_u}{bd} = 1.54$$

$$p_t = \frac{100 A_{st}}{b \cdot d} = 1.55$$

$$V_{us} = V_u - \tau_c \, b \, d$$

$$= 103.68$$

Provide 2 legged 8mm @ 300 c/c.



(2)

$l_x = 3m$ L.L $= 3\ kN/m^2$

$l_y = 5m$ F.F $= 1.0\ kN/m^2$

$f_{ck} = 20\ N/mm^2$ $f_y = 415$

Depth calculation :

$$\frac{l_x}{30} = \frac{2000}{20} = 150\ mm$$

$\therefore D = 150\ mm$

Effective span

$l_x = L + \text{bearing} + \frac{\text{bearing}}{2}$

$= 3 + 0.3 = 3.3\ m$

Similarly, $l_y = 5.3\ m$

$l_y = 5.116\ m$

Load calculation

$W = 0.15 \times 25 + 5$

$= 7.75\ kN/m$

$W_u = 7.75 \times 1.5 = 11.62\ kN/m$

B.M

$m_x = \alpha_x W l_x^2$

$m_y = \alpha_y W L_x^2$

m_x = 12.48 kNm

m_y = 4.58 kNm

$M_{u\,lim} = 0.36 \frac{x_u}{d}\left(1 - 0.42 \frac{x_u}{d}\right) b d^2 f_{ck}$

= 67.25 kNm

$M_{u\,lim}$ = 40.45 kNm

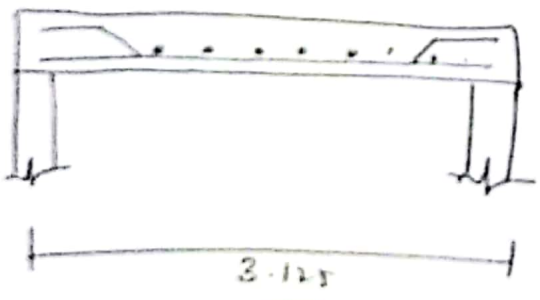
Cal of A_{st}

$M_u = 0.87 f_y A_{st} d \left(1 - \frac{A_{st} f_y}{b \cdot d f_{ck}}\right)$

A_{st} = 290.53 mm²

$A_{st\,y}$ = 111.085 mm² Provide 8mm @ 125mm c/c.

MS I



(2)

Area of steel (A_{sc})

$$P_u = 0.4 f_{ck} A_c + 0.67 f_y A_{sc}$$

$$A_c = A_g - A_{sc}$$

$$= (400 \times 500) - A_{sc}$$

$$A_c = 200000 - A_{sc}$$

$$A_{sc} = 3730.6 \text{ mm}^2$$

using 25mm ϕ bar $\frac{\pi}{4} 25^2 = 490 \text{mm}^2$

No of bars $= \frac{3730.5}{490} = 7.6 \approx 8$

$\therefore$ Provide 8 - 25 mm ϕ

Lateral ties

→ $\frac{1}{4} \times 25 = 6.25$ mm

→ 6mm ∴ use 8mm dia ties.

Pitch of ties.

→ 400mm, → $16 \times 25 = 400$ mm → 300mm