Sub: 15CV72. Scheme & Solution.

11/09/2018. 1ST Internal Assesement Test

1. $H = \frac{4\times10^5}{10^3} * \frac{4}{\pi D^2}$, $H = 4m$.

$\Rightarrow D = \sqrt{\frac{400}{\pi}} = 11.28 \simeq 11.50m.$

Hoop's steel reinforcement:

$F = \frac{\omega H D}{2} = 226\ kN.$

$A_{St} = \frac{F}{\sigma_{St}} = \frac{226\times10^3}{150} = 1506.67\ mm^2.$ ---- (10) Mark

12mm ϕ bars $\Rightarrow$ Spacing $= \frac{1.13*100}{1506.67} * 1000$

$= 75\ mm\ c/c.$

(a) Bottom 1m @ 12mm ϕ, 75mm c/c.

(b) Next 1m, $H = \int_2^3 F(dx) \Rightarrow F = 169.50\ kN.$

$A_{St} = \frac{169.50}{150}\times10^3 = 1130\ mm^2.$ ----

12mm ϕ bars $\Rightarrow$ Spacing $= \frac{1.13\times100}{1130} \times 1000$ ---- (10) Mark

$= 100\ mm\ c/c.$

(c) $H = \int_{2}^{1} F(dx) \Rightarrow F = 113\,KN,$

$$A_{St} = \frac{113\times10^3}{150} = 753.33\,mm^2,$$

$$Spacing = \frac{1.13\times100}{1000\,(753.33)} \times 1000\times1000 = 150mm\ c/c.$$

---- (10) Mark

(d) $$T = \frac{F_{max}}{\sigma_{ct}} = \frac{226\times10^3}{1.3} = 170mm.$$

(e) $H = \int_{1}^{0} F(dx) \Rightarrow F = 65\,KN$

$$A_{St} = \frac{65\times10^3}{150} = 433.33\,mm^2.$$

---- (12) Mark

$$Spacing = \frac{1.13\times100}{433.33} \times 1000 = 240mm\ c/c.$$

(f) Base slab: 12mm ϕ, b/w @ 150 mm c/c mesh both Top and bottom.

Vertical dist reinforcement $= \frac{0.3}{1000} \times 1000 * 170$

$= 510\,mm^2.$

$$Spacing = \frac{\pi}{4}\frac{\times10^2}{510} \times 1000 = 150mm\ c/c.$$

---- (08) Mark

$$D_F = \frac{160}{16}\left[\frac{1-\sin 33^\circ}{1+\sin 33^\circ}\right]^2 = 0.87 \simeq 1\text{m}.$$

$H = 6 + h_1 = 7\text{m}.$, $b' = 5\text{m}$, $b_t = 0.5\text{m}$

$$k_a = \frac{1-\sin\phi}{1+\sin\phi} = 0.29.$$

$$M = \frac{\omega l^2}{10} = 27.59\ \text{kN-m}, \quad V_u = 55.2\text{kN}$$

$M_u = 41.4\ \text{kN-m}$,

$$d = \sqrt{\frac{(M_u)}{0.138\, f_{ck}\, b}} = 109.55 \simeq 110\text{mm}$$

$D = 110 + 60 = 170\text{mm}.$

$D_u = 3 \times 170 = 510\text{mm}.$ ---- (15) Mark

Design of stem:

$$M_u = \left[0.87 f_y A_{st} \cdot d\right]\left[1 - \frac{A_{st} \cdot f_{gk}}{bd \cdot f_{ck}}\right]$$

$$41.4 * 10^6 = \left[0.87 \times 415\, A_{st} \cdot 390\right]\left[1 - \frac{A_{st} \cdot 415}{1000 \times 390 \times 25}\right]$$

Solving, $A_{st} = 297.80\ \text{mm}^2$. ---- (15) Mark

Increase Value by FOS = 2.

$\therefore A_{st} = 2 \times 297.80 = 595.60 \text{ mm}^2$.

Spacing of 12mm ϕ bars $= \dfrac{1.13 \times 100}{595.60} \times 1000 = 200 \text{ mm c/c}$.

Dist Steel $= \dfrac{1.13 \times 1000 \times 100}{\left(\frac{2}{3} \times 595.60\right)} = 283.17$ Say 280 mm c/c.

Links: $\dfrac{A_{st}}{bd} = \dfrac{0.85}{f_y} \Rightarrow A_{st} = 2708 \text{ mm}^2$.

Provide 6 No of 25mm ϕ. B/W. ---- (20 Mark)

End of scheme.