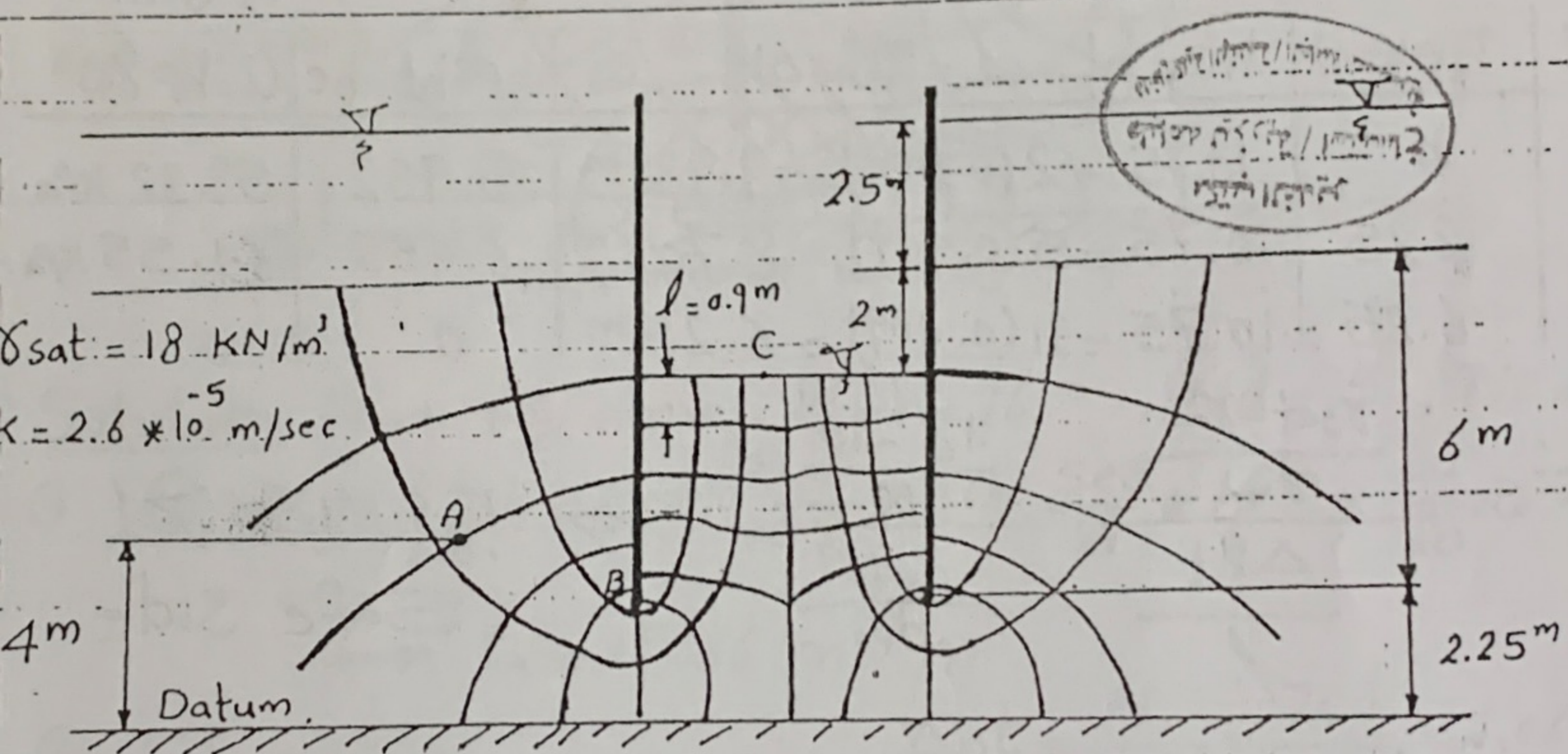


Ex 18: For the Cofferdam shown in the Fig. below; Find:

- ① The Capacity of the pump required.
- ② Pore water Pressure at Points A, B, C.
- ③ Factor of Safety against piping.
- ④ What height of water outside the Cofferdam would give F.S. = 2.



Solution: From the Fig. above: $N_d = 11$, $N_F = 6$

$H = 4.5 \text{ m}$ (ارتفاع منسوب الماء قبل وبعد السد)

① Capacity of the Pump $\rightarrow q = K H \frac{N_F}{N_d}$

$$\rightarrow q = 2.6 \times 10^{-5} \frac{\text{m}}{\text{sec}} * \frac{3600 \text{ sec}}{1 \text{ hr}} * \frac{24 \text{ hr}}{1 \text{ day}} * 4.5 \text{ m} * \frac{6}{11}$$

$$\rightarrow q = 5.514 \frac{\text{m}^3}{\text{day} \cdot \text{m}}$$

$$\textcircled{b} \quad \Delta h_t = \frac{H}{Nd} = \frac{4.5}{11} \Rightarrow \Delta h_t = 0.409 \text{ m/متر}$$

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at Top Surface: $h_p = 0$

$$h_e = 2.25 + 6 + 2.5 \Rightarrow h_e = 10.75 \text{ m}$$

$$\Rightarrow h_t = h_p + h_e \Rightarrow h_t = 10.75 \text{ m} = h_t \text{ at N.G.L.}$$

Point	h_e (m)	$h_t = h_{t \text{ N.G.L.}} - \Delta h_t \times \text{عدد طبقات}$	$h_p = h_t - h_e$	$U = h_p \gamma_w$
A	4	$10.75 - 2(0.409) = 9.932 \text{ m}$	5.932	59.32 kPa
B	2.25	$10.75 - 5(0.409) = 8.705 \text{ m}$	6.455	64.55 kPa
C	6.25	$10.75 - 11(0.409) = 6.25 \text{ m}$	0	0

$$3) \quad F.S. = \frac{\frac{\gamma_{sat} - \gamma_w}{\gamma_w}}{\frac{\Delta h_t}{\rho}} = \frac{\frac{18 - 10}{10}}{\frac{0.409}{0.9}} \Rightarrow F.S. = 1.76 > 1$$

Safe Side