

## ANSWERS

1.1.(a)	1.2. (d)	1.3.(c)	1.4.(c)	1.5.(c)	1.6.(a)	1.7.(c)	1.8.(d)	1.9. (b)	1.10.(c)
1.11.(c)	1.12. (c)	1.13.(c)	1.14.(b)	1.15.(a)	1.16.(b)	1.17.(a)	1.18.(d)	1.19. (b)	1.20.(d)
1.21.(c)	1.22. (d)	1.23.(b)	1.24.(a)	1.25.(b)					
2.1.(c)	2.2.(a)	2.3.(c)	2.4. (b)	2.5.(b)	2.6.(d)	2.7 (a)	2.8.(b)	2.9.(b)	2.10.(a)
2.11.(b)	2.12.(a)	2.13.(d)	2.14. (b)	2.15.(c)	2.16.(a)	2.17. (b)	2.18.(c)	2.19.(a)	2.20.(c)
2.21.(d)	2.22.(b)	2.23.(b)	2.24. (a)	2.25.(a)					

## EXPLANATIONS

10.  $\tan \phi_w = \frac{\gamma'}{\gamma_{sat}} \left( \frac{1}{F_d} \tan \phi' \right)$   
 $= \frac{10}{20} \left( \frac{1}{1.5} \tan 30 \right)$

or  $\phi_w = 10.89^\circ$

11.  $S = c + \sigma' \tan \phi$   
 $= 10 + (150) \tan 30$   
 $= 96.6 \text{ kPa}$

12.  $k = C_v m_v \gamma_w$

$$T_v = \frac{\pi}{4} (v)^2 = \frac{C_v t}{h^2}$$

$$t_1 = \frac{h_1^2 v_1^2}{k_1} m_v \gamma_w$$

and  $t_2 = \frac{h_2^2 v_2^2}{k_2} m_v \gamma_w$

$$\frac{t_1}{t_2} = \left( \frac{h_1}{h_2} \right)^2 \times \left( \frac{v_1}{v_2} \right)^2 \times \left( \frac{k_2}{k_1} \right) \times \left( \frac{m_{v_2}}{m_{v_1}} \right)^2$$

$$= \frac{1}{4} \times 1 \times \frac{1}{10} \times 4 = \frac{1}{10}$$

$$t_2 = \frac{t_1}{10} = \frac{10}{10} = 1 \text{ year}$$

13. Given  $\sigma_1 = 60, \sigma_3 = 20$

Now  $\sigma_1 = \sigma_3 N_\phi + 2c \sqrt{N_\phi}$

where  $c = 0$

$$\therefore \frac{\sigma_1}{\sigma_3} = N_\phi = \frac{60}{20} = 3$$

$$\therefore \tan \left( 45 + \frac{\phi}{2} \right) = \sqrt{3} = 1.732$$

or  $45 + \frac{\phi}{2} = 60$

or  $\frac{\phi}{2} = 60 - 45$

$\therefore \phi = 30^\circ$

14.  $k = \frac{\alpha L}{At} \log_e \left( \frac{n_1}{n_2} \right)$

where,  $a = \frac{\pi}{4} (.5)^2 = 0.196$

$$A = \frac{\pi}{4} (20)^2 = 78.54 \text{ cm}^2$$

$$L = 20 \text{ cm}$$

$$t = 3 \times 60 \times 60$$

$$\therefore k = \frac{196 \times 20}{7.054 \times 60 \times 3 \times 60} \log \left( \frac{1}{35} \right)$$

$$= 4.86 \times 10^{-6} \text{ cm/sec}$$

15.  $\frac{y_2}{y_1} = \frac{1}{2} \left[ -1 + \sqrt{1 + 8F_1^2} \right] = 3.77$

$$\therefore \frac{y_1}{y_2} = \frac{1}{3.77} \left[ -1 + \sqrt{1 + 8F_2^2} \right]$$

$$F_2 = 0.41$$

17. Rain = Rainfall - Rainoff

$$= 0.8 \times 6 - \frac{256000}{8.6 \times 10^6}$$

$$= 0.304$$

