

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course code: CE 208

Course name: Geotechnical Engineering I (CE)

PART A

1. a. Definition of void ratio, porosity, water content and degree of saturation = 4 x 1.25 = 5 marks.

(b). equation - 1 mark, $\gamma = \frac{(G+eS_r)\gamma_w}{1+e}$
 Derivation - 4 marks.

(c). equations - 2 marks each.

$w, e, S_r, n = 1$ mark each.

$w = 26.9\%$ - 1 mark

$e = 0.73$ - 1 mark.

$n = 0.43$ - 1 mark.

$S = 98.5\%$ 1 mark.

2(a) Stoke's law - 2 marks.

limitations - 3 marks.

(b) tabular form - 2 marks

graph - 3 marks.

C_u eqn - 1 mark

$C_u = 5.27$ - 1 mark

C_c eqn - 2 marks.

$C_c = 1.32$.

Comment - 2 marks. \rightarrow well graded.

(2)

3(a). $\sigma_d = \frac{\sigma}{1+e} = \frac{C132e}{1+e}$ - 2 marks

$e = \frac{wLc}{Sr}$ - 1 mark.

$\sigma_d = 1.516 \text{ t/cc}$ - 1 mark

$e = 0.51$ - 1.5 marks

$S = 95.7\%$ - 1.5 marks.

(b) eqn. $I_p = 0.73 (w_L - 20)$ - 1 mark

Ans. Plasticity chart with position of sample - 5 marks.
classification - 1 mark

Part B
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4(a) Darcy's law - 2 marks

coeff of permeability - 3 marks.

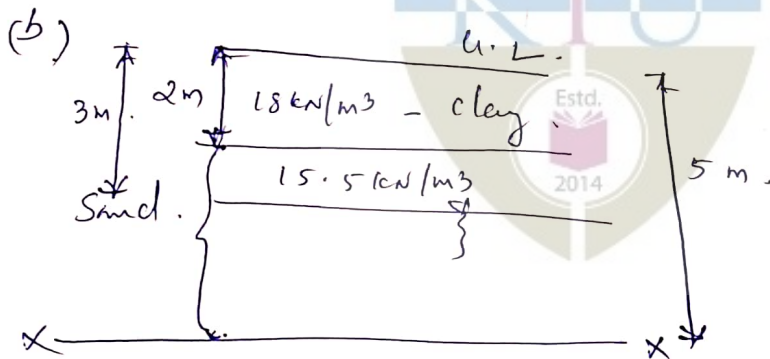


Fig - 2 marks.

Total stress - eqn. - 1

Ans. - 2

Neutral stress eqn. - 1

Ans. - 2.

Total stress = 87.9 kN/m^2

Neutral stress = 20 kN/m^2

Effective stress = 67.9 kN/m^2

Effective stress eqn - 1 mark (3)

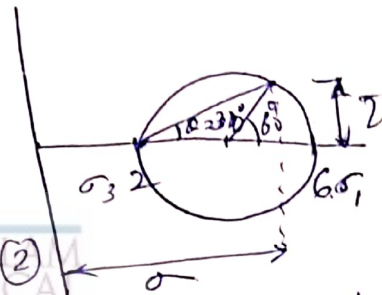
Ans - 2 marks.

5a. Defn of Mohr circle - 2.

determining stresses on planes with sketches - 5 marks.

(b) Named stress.

Shear stress



graphically or Analytically.

$$\sigma = \left(\frac{\sigma_1 + \sigma_3}{2} \right) + \left(\frac{\sigma_1 - \sigma_3}{2} \right) \cos 2\theta \quad \text{--- (2)}$$

$$\tau = \left(\frac{\sigma_1 - \sigma_3}{2} \right) \sin 2\theta \quad \text{--- (2)}$$

$\sigma = 5 \text{ kPa}$, $\tau = 1.73 \text{ kPa}$ - 2 marks.

6a. Derivation with necessary sketches = $2 \times 3.5 = 7$.

(b). eqn - $k = \frac{2.303 \cdot a \cdot b \cdot \log\left(\frac{h_1}{h_2}\right)}{A \cdot t}$

eqn with units used - 3 marks.

$$k = 7.081 \times 10^{-6} \text{ cm/sec} = 7.13 \times 10^{-6} \text{ cm/sec}$$

$$= 6.16 \times 10^{-3} \text{ m/day} \quad \text{--- 5 marks.}$$

7a. Compression index. defn - 1 mark.

determination - 4 marks.

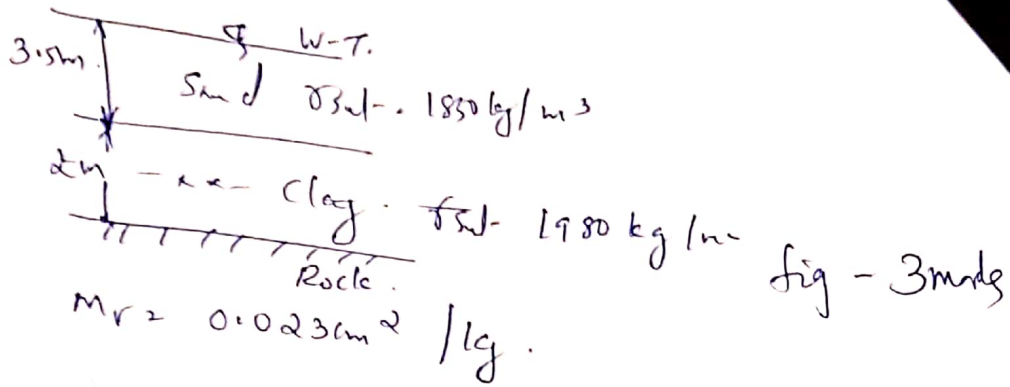
- (b) Normally consolidated - 1.5 marks
- under consolidated - 1.5 marks
- over consolidated - 2 marks.

(c).

Descripton

(4)

marks



$$\Delta H = M_v H \Delta \sigma \quad - 1 \text{ mark}$$

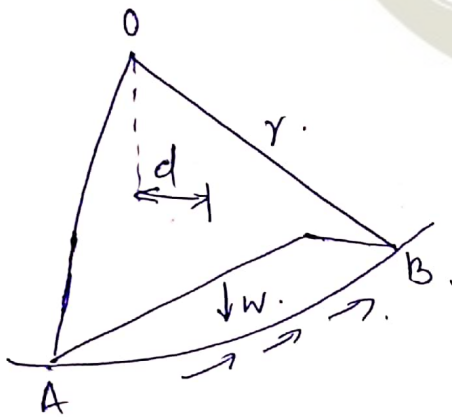
$$H = 2 \text{ m}$$

$$\bar{\sigma} = 3755 \text{ kg/m}^2 \quad - 3 \text{ marks}$$

$$\Delta \sigma = 0.5 \bar{\sigma} = 1977.5 \text{ kg/m}^2 \quad - 1 \text{ mark}$$

$$\Delta H = 9.096 \text{ mm} \quad - 2 \text{ marks}$$

8a. Descripton with fig - 6 marks



Drawing - 3 marks

Procedure - 7 marks

$$T_s = \Sigma c' + \tan \phi \Sigma N'$$

$$\Sigma N' = \Sigma N \cos \alpha$$

(5)

8b. - γ_d - eqn. - 2 marks.
 S_r - 79% - 4 marks
 γ_d at 100% saturation - 4 marks
 $= 1.82 \text{ g/cc.}$

9a. Figure - 3 marks.
 explanation with eqn. 7 marks
 $C_v = \frac{T_v d^2}{t_{90}}$ double drainage $d = H/2$
 single drainage $d = H$

(b). eqn. - 1 mark
 derivation - 4 marks.
 2 marks -
 (c) γ_{sat} - 2 marks.
 Heavy compaction - 2 marks.
 Applications - 1 mark.

