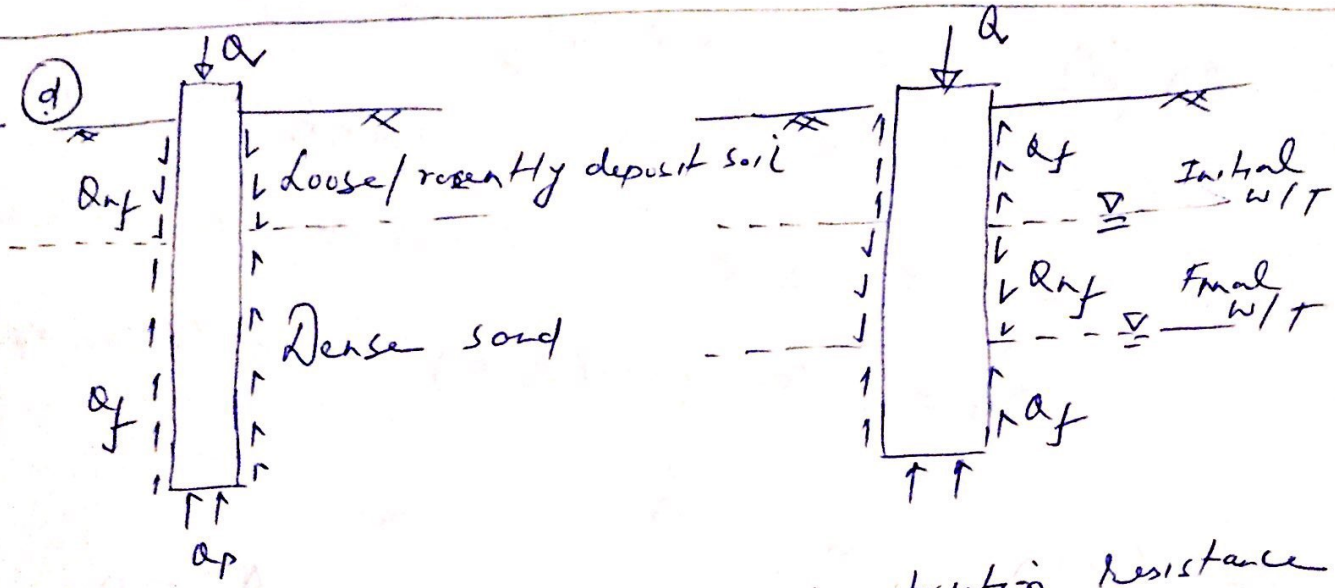
Department of Civil Engg (KEC, Kathkal)

Solution of class Test-I

Subject: Foundation Engg.
Instructor: Rashid Mustafa

Class: B.Tech
Semester: 7th

Q-1 (d)



Where, Q_{nf} → Negative skin friction resistance
Q_f → frictional resistance
Q_p → point resistance

Q-2 (13.45 mm) $D = 1.5\ m$

$$q = \frac{150}{\frac{\pi}{4} \times 1.5^2} = \frac{600}{\pi \times 1.5^2} = 84.93\ \frac{kN}{m^2}$$

$$\text{Elastic / Immediate settlement } (S_i) = \frac{q \cdot D (1-\nu^2)}{E_s} \times I.F$$

$$= \frac{84.93 \times 1.5 \times (1-0.25^2)}{7000} \times 0.79$$

$$= 0.01345\ m$$

$$= 13.45\ mm$$

Q.3 (α) (c)

Plate load test is useful to estimate
- Bearing capacity of soil
- Settlement of footing

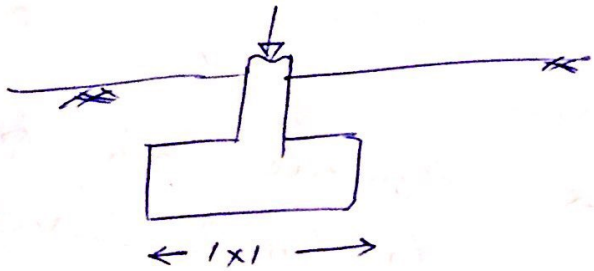
(β) (d) $c = 30\ kN/m^2$, $\phi = 27°$

Since $\phi < 29°$ (Local shear failure)

$$C_m = \frac{2}{3}c = \frac{2}{3} \times 30 = 20\ kN/m^2$$

$$\phi_m = \tan^{-1}\left(\tan\left(\frac{2}{3}\phi\right)\right) = \tan^{-1}(\tan 18)$$

Q-4. (42)



$D_f = 0$

For clayey soil, Bearing capacity factor

$N_c = 5.7$, $N_q = 1$, $N_\gamma = 0$

$q_u = cN_c + \gamma D_f \overset{\phi=0°}{=} cN_c = 42$

Since ultimate bearing is independent of size of footing, so ultimate bearing capacity will be same (42) for 4m×4m footing.

Q-5 (A-1, B-2, C-4, D-3)

SPT test :
* Suitable for Cohesionless soil
* Wt of hammer = 65 kg
* Height of fall = 75 cm
* gives Penetration Resistance (N)

Plate Load test: * used to calculate Bearing Capacity
* Gives Load - Settlement Data.
* Suitable for Coarse grained soil

Field Vane shear test: * used for Stiff clay

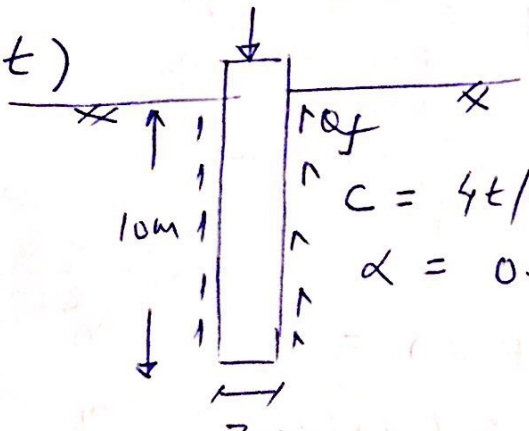
* $S = \frac{T}{\pi D^2 (\frac{H}{2} + \frac{D}{6})}$

* $S = \frac{T}{\pi D^2 (\frac{H}{2} + \frac{D}{12})}$

Where T → Torque
S → Shear Strength

Cone Penetration test (CPT): * used to calculate Point Resistance & Skin Resistance
* Steel Cone is used.
* Apex Angle 60°, Base Area is 10 cm²

Q-6 (10.55 t)



$Q_u = Q_p^0 + Q_f$ [bcz friction pile is given]

$Q_u = \pi d L \alpha C_u$

$= \pi \times 0.30 \times 10 \times 0.7 \times 4 = 26.376\ t$

Safer load $(Q_s) = \frac{Q_u}{FOS} = \frac{26.376}{2.5} = (10.55\ t)$

Q-7. (A) (3D)

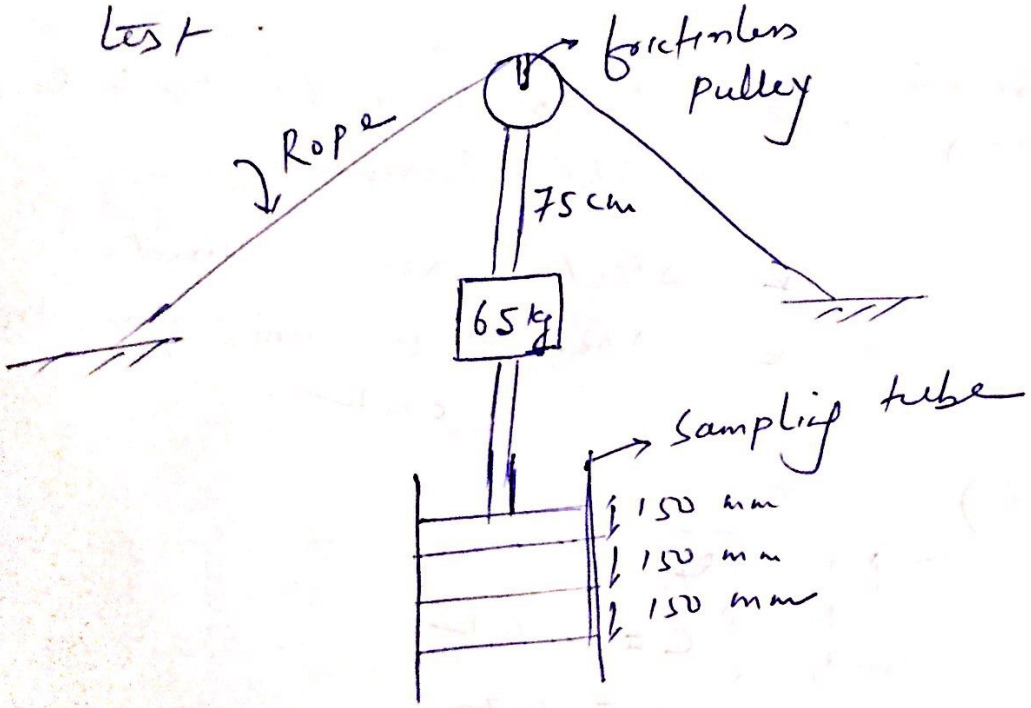
Min^m Centre to Centre spacing of friction Pile = 3D

Min^m Centre to Centre spacing of ~~Point~~ End bearing pile = 2.5D

Pile in loose sand = 2.0D

(B) 65 kg, 75 cm

→ Hammer is used to perform SPT test.



Q-8 (A) Weight (W) = 25 kN

Height (H) = 0.80 m

S = 12 mm = 1.2 cm

A/c to Engineering News formula $(Q_a) = \frac{WH}{6(S+C)}$

$= \frac{25 \times 80}{6(1.2+2.5)} = 90\ kN$

Q-9 (1620 kN)

$$Q_{ug(I)} = 200 \text{ kN}$$

$$\text{Efficiency } (\eta_g) = \frac{Q_{ug(B)}}{n \cdot Q_{ug(I)}}$$

$$0.90 = \frac{Q_{ug(B)}}{9 \times 200}$$

$$Q_{ug(B)} = 1800 \times 0.9 = 1620 \text{ kN}$$

Q-10 (C)

$$N_{obs} = 30$$

$$N_c = 15 + \frac{1}{2}(N_{obs} - 15)$$

$$= 15 + \frac{1}{2}(30 - 15)$$

$$= 22.5 \simeq 23$$

END OF SOLUTION

Note: If any doubt, mail on www.talktorashid@keck.ac.in