CVL701: Site Investigations & Foundations

Major Test: Answer All Questions

19/11/2017

Max. Marks 35 Time : 2 Hours

1. Compute the ultimate axial capacity of the pile shown in Fig. 1. (divide the pile into 3 segments, use Tomlinson's graphs). What percentage of the total capacity is obtained from end bearing. (5)

2. Compare the uplift capacity of the pile shown in Fig. 2 with that of a bored cast-in-situ pile (slurry method, good construction)of the same length and cross-sectional area. (5)

3. List at least 3 conditions which go against the adoption of a driven pile. (2)

4. Compute the settlement at the top of the pile shown in Fig 3, when 50% of the ultimate load is applied at the top. Assume the pile is infinitely rigid with no elastic deformation. (5)

5. In which pile group shown in Fig 4 is it most likely that block failure will occur and in which group is it least likely? Give one-sentence reason for each answer. (2)

6. The tip segment of a pile is shown in Fig 5. The velocity of the compressive wave reaching this segment is 1000 m/sec. What will be the total dynamic soil resistance (both side and tip) offered by this segment during continuous driving, if static skin friction is 50% and static end bearing is 75% of the computed values during continuous driving. (4)

7. How will the lateral load capacity of the short pile shown in Fig 6(a) be affected if (i) the diameter of the pile is doubled with length being constant, (ii) pile length is doubled with diameter being constant (pile continues to be short pile). How will the lateral load capacity of the long pile in Fig 6(b) be affected if length is doubled and diameter is constant. (3)

8. How does the 100% mobilized (peak) vertical stress in a t-z curve compare with the 100% mobilized (peak) horizontal stress in a p-y curve at the same depth for the same pile in clay. Would you observe a similar behaviour in sand? (3)

9. Indicate the preferred method that you will use for the following activities during site investigations undertaken for design of shallow foundations for two sites A and B. The subsoil at site A is saturated clay to deep depth and that at site B is saturated sand to deep depth. (i) drilling; (ii) stabilizing the hole; (iii) sampler type; (iv) penetrating the sampler; (v) in-situ testing; (vi) geophysical testing. (3)

10. A low-rise 4-star hotel (2 storeyed framed structure) is being built in Delhi on Yamuna sand. It will have isolated footings at 0.5m depth under various columns. The owner has decided to build three more hotels with the same superstructure at the following cities. Shallow foundations will be adopted for all hotels. Indicate how the size, shape and location of foundations are likely to change at the various cities in comparison to that at Delhi: (i) hill-side slope near Srinagar; (ii) soft marine clay at the coastline near Kolkatta; (iii) black cotton soil at a site in Madhya Pradesh. (3)

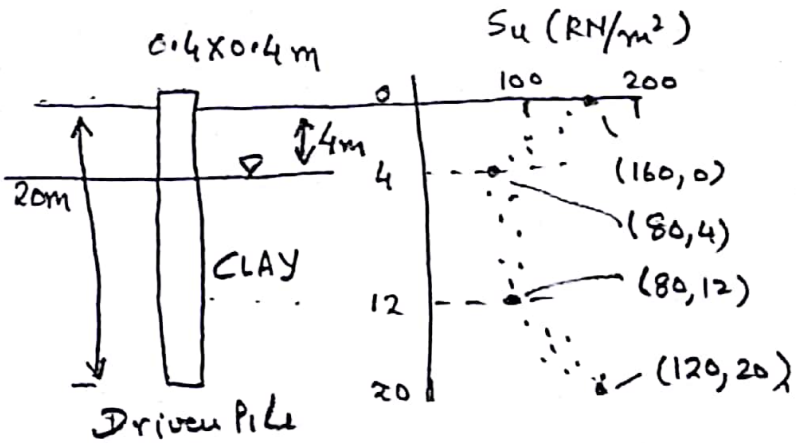


FIG 1

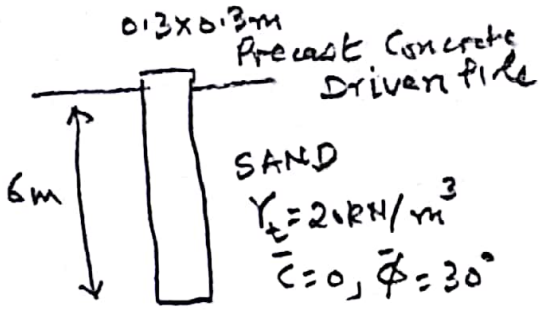
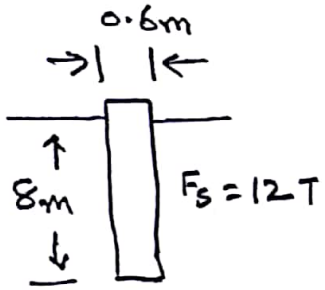


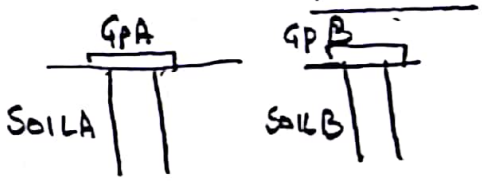
FIG 2



$$\frac{F_{sm}}{F_s} = \left(\frac{\delta}{\delta_{ult}}\right)^{\frac{1}{2}} \leq 1 \qquad \frac{Q_{bm}}{Q_b} = \left(\frac{\delta}{\delta_{ult}}\right)^{\frac{1}{2}} \leq 1$$

Ultimate resistance is developed at 10mm for skin friction and 10% dia for end bearing.

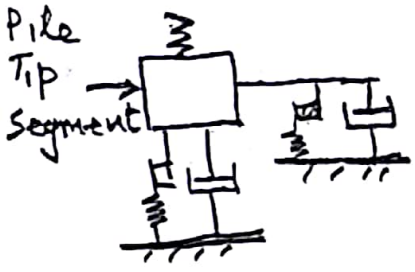
FIG 3



2x2 pile groups, identical piles

For single piles	SoilA	SoilB	SoilC
F_s(T)	20	60	140
Q_b(T)	80	60	60

FIG 4



Computed
- $F_s = 20T$
- $Q_b = 80T$

From instrumented piles
- $f_{side} = 0.9 sec/m$, $q_{k\,side} = 4mm$
- $f_{tip} = 0.3 sec/m$, $q_{k\,tip} = 5mm$

FIG 5

6(a): Short Pile, fixed-headed

6(b): Long Pile, Free headed.

FIG 6