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ANSWER ALL QUESTIONS

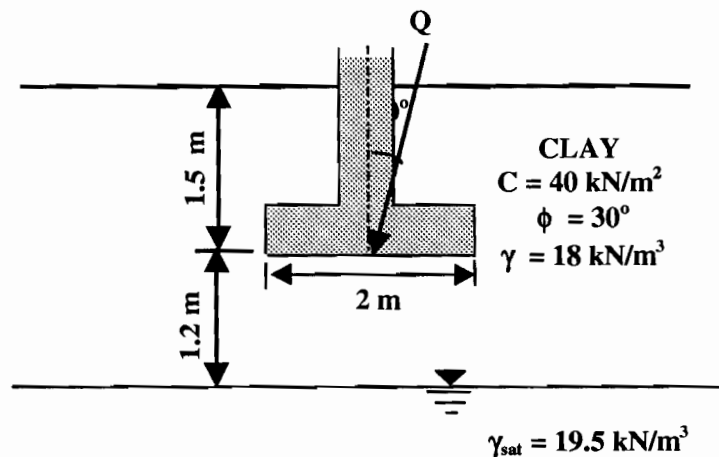
QUESTION # 1 : (15 marks)

Write short notes about **FIVE** of the following:

- i. Undisturbed samples
- ii. Pressuremeter test
- iii. Cross-hole seismic survey
- iv. Punching shear failure in soil
- v. Types of mat foundations
- vi. Contraction joints in retaining walls
- vii. Pile load test

QUESTION # 2 : (15 marks)

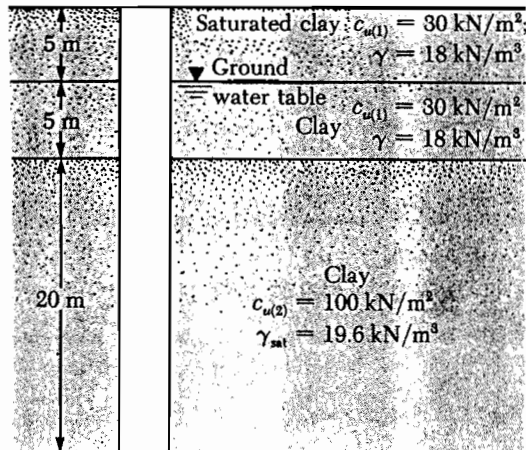
A square foundation has to carry a total load Q . The load is inclined at an angle of 20° to the vertical as shown in the figure below. Determine the allowable gross load that the foundation can carry. Use a factor of safety of 3.



QUESTION #3

A driven pipe pile in clay is shown in the figure below. The pile has an outside diameter of 406 mm, and a wall thickness of 6.35 mm. Calculate the allowable load of the pile (use F.S.= 4).

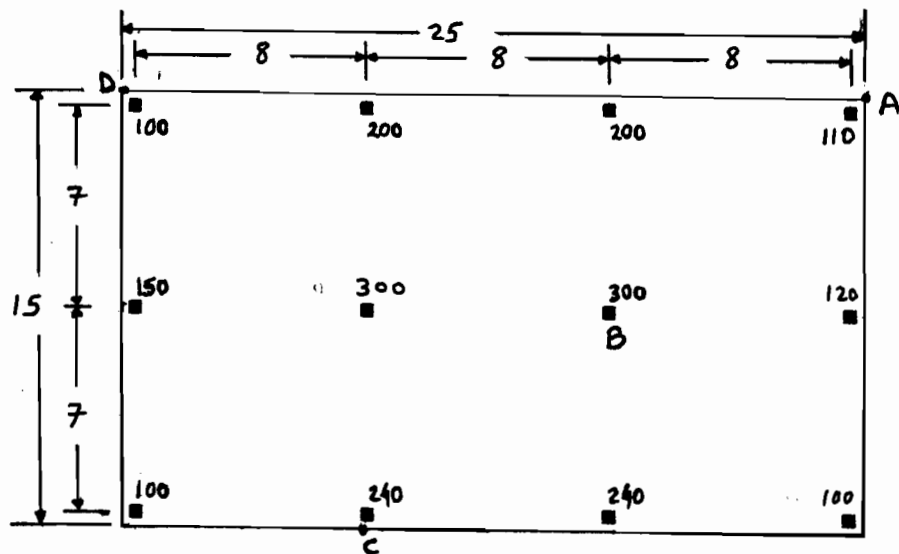
Use both α and λ methods to calculate the ultimate frictional resistance.



QUESTION #4

The plan of a mat foundation is shown in the figure below. Determine the pressure on the soil at points A, B, C, and D. All columns are 0.4 x 0.4 m in cross section.

Loads are in kN.

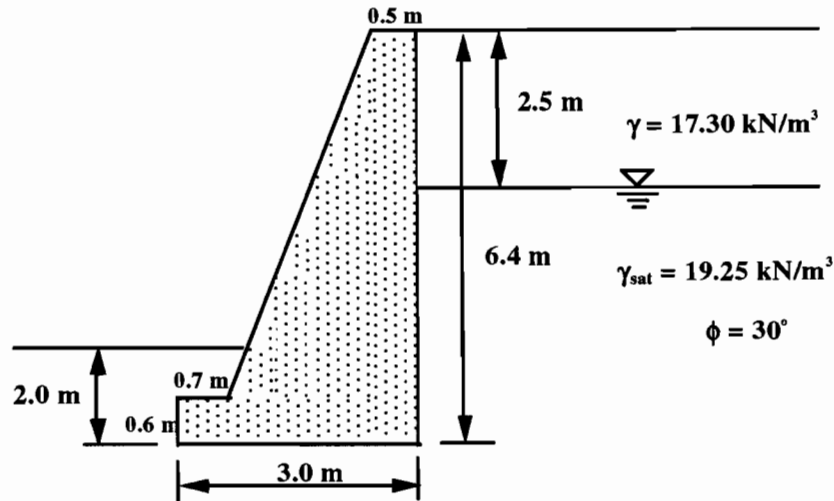


QUESTION # 5 : (15 marks)

A concrete retaining wall is shown in the figure below.

Determine the factor of safety against **overturning** using Rankine's theory (ignore P_p).

Use $\gamma_c = 23.58 \text{ kN/m}^3$ for the wall.



QUESTION # 6 : (20 marks)

A pile group of nine piles is arranged as shown in figure (a) and embedded as shown in figure (b) below. Determine;

- The efficiency of the group.
- The consolidation settlement of the group.

The saturated unit weight of the sand is 19.5 kN/m^3

The clay layer has the following characteristics:

$$\gamma_{\text{sat}} = 18 \text{ kN/m}^3 \quad p_c = 260 \text{ kN/m}^2 \quad e_o = 0.98 \quad c_c = 0.34 \quad c_s = 0.07$$

