

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End-Term Examination

B. Tech. in Civil Engineering, Semester-VI

CE1210: Advanced Foundation Engineering

Time: 3 hours

Max. Marks: 30

Instructions to students:

1. Assume suitable data wherever required and mention it clearly.
 2. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/flowchart wherever, required are an integral part of the answer.
 3. Question 1 is of multiple-choice type. Remaining questions are of descriptive type.
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1(a). Explain in detail the various types of boring. What method of boring (up to a depth of 30 m) would you recommend in a site consisting of gravels and boulders under the sandy layers, located in Jaisalmer.

(7 marks)

(LO-1)

1(b). A long natural slope in an over consolidated clay with $c' = 10 \text{ kN/m}^2$, $\phi' = 25^\circ$ and $\gamma_{\text{sat}} = 20 \text{ kN/m}^3$ is inclined at 10° to the horizontal. The water table is at the surface and seepage is parallel to the slope. If a plane sloop has developed at a depth of 5 m below the surface, determine the factor of safety. Take $\gamma_w = 10 \text{ kN/m}^3$.

(3 marks)

(LO-3)

2(a). Determine the allowable gross load that can be carried by as square footing of 2.5 m side and placed at a depth of 1.5 m. The soil at the site has $\gamma = 18.5 \text{ kN/m}^3$, $C = 13 \text{ kN/m}^2$ and $\phi = 20^\circ$. Take factor of safety of 3.0. Assume N'_c , N'_q and N'_γ as 11.8, 3.9 and 1.3.

(4 marks)

(LO-4)

2(b). In a construction site, a 2 m wide square footing is located in a dense sand at a depth of 1.2 m. The shear strength parameters being $c = 0$, $\phi = 38^\circ$. Determine the ultimate bearing capacity for the following water table positions. **(6 marks)**

(a) at ground surface

(LO-4)

(b) at 1 m below ground surface

(c) at footing level

The moist unit weight of sand above the water table is 19 kN/m^3 and saturated unit weight of soil is 21 kN/m^3 . The values of bearing capacity parameters for $\phi = 38^\circ$ are $N_q = 80.5$, $N_\gamma = 77.20$.

3(a). A square pile group of 9 piles passes through a recently filled up material of 4.5 m depth. The diameter of the pile is 30 cm and pile spacing is 90 cm centre to centre. If the unconfined compression strength of the cohesive soil is 60 kN/m^2 and unit weight is 15 kN/m^3 , compute the negative skin friction of the pile group. **(5 marks)**

(LO-4)

3(b). To construct a school building, 300 mm diameter, 8 m long piles are used as foundations for supporting a column in uniform deposit of medium clay ($q_u = 110 \text{ kN/m}^2$). The spacing b/w the piles is 500 mm. There are 9 piles in the ground arranged in square pattern. Calculate the ultimate pile load capacity of the group. Assume α as 0.9. **(5 marks)**

(LO-4)