

Code No: 117AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, March - 2017

ADVANCED FOUNDATION ENGINEERING

(Civil Engineering)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

Part- A (25 Marks)

- 1.a) Define net ultimate bearing capacity of soil. [2]
- b) Give the various types of shallow foundations [3]
- c) What is negative skin friction in piles? [2]
- d) Explain about under reamed piles. [3]
- e) Define the coefficient of earth pressure at rest. [2]
- f) What is Rankine's active state of soil. [3]
- g) Differentiate between shallow cut and deep cut. [2]
- h) What is a cantilever sheet pile? [3]
- i) What are expansive soils? [2]
- j) Explain the mechanism of swelling. [3]

Part-B (50 Marks)

- 2.a) A concrete footing of $1\text{m} \times 2\text{m}$ size is resting at a depth of 1m in a soil $E=10^4 \text{ kN/m}^2$, $\mu=0.3$. Estimate the immediate settlement if the footing is subjected to a pressure of 200kN/m^2 . Assume footing to be rigid.
- b) A square footing 2.5m size is founded at a depth of 1.5m in a sandy deposit which has the corrected N value of 30. The water table is at a depth of 2m from the ground surface. Find the net allowable soil pressure if i) the desired factor of safety is 3.0 and ii) the permissible settlement is 40mm. Use Teng's equation. [5+5]

OR

3. A strip footing is 2m wide and at a depth of 2m in a soil of 19 kN/m^3 and a cohesion of 10 kN/m^2 . Determine the increase in bearing capacity when ϕ is increased from 20° to 25° . Use Terzaghi's theory. Assume local shear failure. [10]

4. Design a friction pile group to carry a load of 3500 kN including the weight of pile cap, at a site where the soil is uniform clay to a depth of 10 m underlain by rock. The average compressive strength of clay is 50 kN/m^2 . The clay may be assumed to be of normal sensitivity and normally loaded with a liquid limit of 70%. Adopt a factor of safety 2.5 against shear failure. [10]

OR

- 5.a) Describe various types of pile foundations.
b) Discuss different methods for the installation of piles. How would you estimate the load carrying capacity of a pile in cohesionless soils? [5+5]

6. A retaining wall is 7 m high, with its back face smooth and vertical. It retains sand with its surface horizontal. Using Rankine's theory, determine active earth pressure at the base when the backfill is a) dry, b) saturated and c) submerged, with water table at 2 m below the surface. Take $\gamma_t=18 \text{ kN/m}^3$, $\gamma_{\text{sat}}=21 \text{ kN/m}^3$ and $\phi=30^\circ$. [10]

OR

7. Consider a 5m high frictionless retaining wall with a vertical back and inclined backfill. The inclination of the backfill with the horizontal, $\alpha=10^\circ$. For the backfill, given $\gamma=18 \text{ kN/m}^3$, $c'=5 \text{ kN/m}^2$, $\phi'=25^\circ$. Determine Rankine's active force per unit length of the wall after the occurrence of the tensile crack. [10]

8. An excavation 8m deep is to be made in cohesionless soil $\gamma=19 \text{ kN/m}^3$ and $\phi=30^\circ$. The sides of the excavation are supported by anchored sheet piles with fixed end support. Determine the minimum depth of embedment for equilibrium. The anchors are at a depth of 1.5m below the surface. [10]

OR

- 9.a) What is meant by braced excavations? Explain about deep cuts in sand.
b) A cut 3m wide, 6.05m deep is proposed in a cohesionless deposit ($\phi'=36^\circ$) Assuming the first row of struts to be located at 0.5m below ground surface and spacing between the struts as 1.5m. Calculate the maximum strut load. Assume the horizontal spacing of struts as 3m, $\gamma=20 \text{ kN/m}^3$ and $\delta=15^\circ$. [5+5]

10. Describe the various stabilization methods of expansive soils with suitable examples. [10]

OR

- 11.a) Discuss the problems in expansive soils with suitable examples.
b) Explain about under reamed pile foundations for expansive soils. [5+5]

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