KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2018
(Regulation 2015)
Sixth Semester
CIVIL ENGINEERING
U15CET603**:** Geotechnical Engineering-II
(Use of Terzaghi's bearing capacity tables permitted)

COURSE OUTCOMES

CO1: Select suitable type of foundation required for the given soil condition.
CO2: Analyze the settlement of the foundation on different types of soil
CO3: Find the safe overall dimensions for various types of foundations
CO4: Assess the load capacity of the group of piles.
CO5: Carry out stability analysis of retaining walls.
CO6: Implement various ground improvement techniques in the field.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1. Match the following: CO4 [K$_2$]

Boring methods	**Field conditions**
A. Auger boring	i. Below water table in all soil types except hard soils and rocks
B. Wash boring	ii. Large diameter boreholes over 150 mm in size
C. Percussion boring	iii. Exploration for shallow foundation and highways
D. Rotary boring	iv. Bouldery and gravelly strata

	A	B	C	D
a)	iii	i	iv	ii
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. Which one is Jacky's formula for determination of earth pressure at rest condition?   CO5   [K$_1$]

a)   1-sin   b)   1+sin

c)   1-cos   d)   1+cos

3. Based on the comments about dynamic formulae, pick up the correct statements from the following: CO4 [K2]

    1. In Engineering News formula, the weight of the pile and its inertia effect is considered.

    2. In Hiley's formula, a number of constants are involved, which are difficult to determine.

    3. Dynamic formulae give no indication about probable future settlement or temporary changes in soil structure.

a) 1,3   b) 1,4

c) 1,2   d) 2,3

4. The following two statements are made with reference to the calculation of net bearing capacity of a footing in pure clay soil using Terzaghi's bearing capacity theory. Identify if they are true or false. CO2 [K2]

I) Increase in footing width will result in increase in bearing capacity

II) Increase in depth of foundation will result in higher bearing capacity

a) Both statements are true   b) Both statements are false

c) I is true but II is false   d) I is false but II is true

5. Assertion (A): A strip footing is provided for a non-load bearing wall. CO3 [K2]

Reason (R): A strip footing is also known as continuous footing.

a) Both A and R are Individually true and R is the correct explanation of A   b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false   d) A is false but R is true

6. The degree of disturbance for a soil sample is usually expressed by CO1 [K1]

a) Void ratio   b) Area ratio

c) Recovery ratio   d) Consolidation ratio

7. Sequence the procedure for standard penetration test: CO2 [K2]

1. Rest the split spoon sampler at the foundation level

2. Apply overburden and dilatancy correction

3. Note the number of blows taken for every 15cm penetration of sampler

4. Determine the ultimate bearing capacity

a) 2-3-4-1   b) 1-3-2-4

c) 3-4-2-1   d) 4-1-3-2

8. Pick down the correct statements from the following: CO5 [K₂]

    1. A retaining wall is used for maintaining the ground surfaces at different elevations on either side of it.

    2. The material retained or supported by the structure is called backfill which may have its top surface horizontal or inclined.

    3. The inclination of backfill to the horizontal is called surcharge angle.

a) 1,2   b) 1,3

c) 2,3   d) 1,2,3

9. Assertion (A): Shallow foundation is usually defined as a foundation which has width less than its depth. CO3 [K₂]

Reason (R): Raft foundation is a type of shallow foundation.

a) Both A and R are Individually true and R is the correct explanation of A   b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false   d) A is false but R is true

10. Two footings, one circular and the other square, are founded on the surface of a purely cohesionless soil. The diameter of the circular footing is same as that of the square footing. The ratio of their ultimate bearing capacities is CO2 [K₂]

a) 3/4   b) 4/3

c) 1.0   d) 1.2

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Define Feld's rule.   CO4 [K₁]

12. List down the assumptions made in Terzaghi's analysis of bearing capacity.   CO2 [K₁]

13. What is negative skin friction?   CO4 [K₂]

14. Draw ne plan and sectional view of strap footing.   CO3 [K₂]

15. What is mat foundation?   CO4 [K₂]

16. Differentiate between general shear failure and local shear failure.   CO2 [K₂]

17. List the types of samplers.   CO1 [K₁]

18. What is soil exploration?   CO1 [K₁]

19. Write down the assumptions made in Coulomb wedge theory.   CO5 [K₁]

20. Differentiate between active earth pressure and passive earth pressure.   CO5 [K₂]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. A strip footing 2 m wide carries a load intensity of 400 kN/m² at a depth of 1.2 m in sand. The saturated unit weight of sand is 19.5 kN/m³ and unit weight above water table is 16.8 kN/m³. The shear strength parameters are c = 0 and φ = 35°. Determine the factor of safety with respect to shear failure for the following cases of location of water table: CO2   [K₃]
   (i) Water table is at ground level
   (ii) Water table is 2.5 m below ground level
   (iii) Water table is at base of footing itself

22. What is combined footing? Explain the design procedure for a rectangular combined footing to carry loads from two different columns.   CO3   [K₂]

23. A group of 9 piles arranged in a square pattern with diameter and length of each pile as 25 cm and 10 m respectively, is used as a foundation in soft clay deposit. Taking the unconfined compressive strength of clay as 120 kN/m² and the pile spacing as 100 cm centre to centre, find the load capacity of this group. Assume the bearing capacity factor N_c=9 and adhesion factor =0.75. A factor of safety of 2.5 may be taken.   CO4   [K₃]

24. (i) Compute the intensities of active and passive earth pressure at depth of 8 metres in dry cohesionless sand with an angle of internal friction of 30° and unit weight of 18 kN/m³. What will be the intensities of active and passive earth pressure if the water level rises to ground level? Take saturated unit weight of sand as 22 kN/m³. Draw the pressure variations. (10)   CO5   [K3]
(ii) State assumptions made in Rankine's earth pressure theory. (4)   CO5   [K₂]

25. Explain about different methods of stabilization of soil in detail.   CO6   [K₆]

26. Explain in detail, how standard penetration test is conducted? Using the test data how to estimate the bearing capacity of soil?   CO2   [K₂]

27. What are the different types of shallow foundations? Explain with the help of sketches.   CO3   [K₂]

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