Hall Ticket No | | | | | | | | | | | Question Paper Code: ACEB38

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - DECEMBER 2022

Regulation: R18

FOUNDATION ENGINEERING

Time: 3 Hours **(CIVIL ENGINEERING)** **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Enumerate the various methods of soil exploration and mention the circumstances under which each is best suited. What do you mean by undisturbed sample?
[BL: Understand| CO: 1|Marks: 7]

   (b) The cone penetration resistance obtained in a clay soil in a CPT was 50 kg/cm^2. Determine the undrained strength of clay. The total overburden pressure at the depth was 100 kN/m^2.
[BL: Apply| CO: 1|Marks: 7]

2. (a) Name few geophysical investigation techniques. Discuss the site investigation methods with the help of neat sketches. [BL: Understand| CO: 1|Marks: 7]

   (b) A SPT was conducted in a dense sand deposit of 20m, and a value of 35 was observed for N. The density of the sand was 16kN/m^3. What is the value of N, corrected for overburden pressure?
[BL: Apply| CO: 1|Marks: 7]

MODULE – II

3. (a) Explain the stability analysis by Swedish slip circle method and derive the factor of safety.
[BL: Understand| CO: 2|Marks: 7]

   (b) An embankment 10m high is inclined at an angle of 36° to the horizontal. A stability analysis by the method of slices gives the following forces per running meter: σ shearing forces = 450kN σ normal forces = 900kN σ neutral forces = 216kN The length of the failure arc is 27m.
   Laboratory tests on the soil indicate the effective values c' and ϕ' as 20kN/m^2 and 18^0 respectively. Determine the factor of safety of the slope with respect to i) Shearing strength ii) Cohesion.
[BL: Apply| CO: 2|Marks: 7]

4. (a) Describe the stability of earthen dam in full reservoir condition, sudden drawn down condition and at the end of the construction. [BL: Understand| CO: 2|Marks: 7]

   (b) It is proposed to construct a highway embankment using a c-ϕ soil having c = 25kPa, $\phi = 20^o$, γ = 17kN/m^3. Determine the critical height up to which the embankment can be built with an inclination of 30^0 with a factor of safety of 1.50. Given the Taylor's stability number for these conditions as 0.0737. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

5. (a) Determine the expression for coefficient of active and passive earth pressure coefficients according to Rankines earth pressure theory. [BL: Understand| CO: 3|Marks: 7]

(b) A 9m high retaining wall is supporting a backfill consisting of two types of soils. The water table is located at a depth of 5m below the top. The properties of soil from 0 to 3m include c = 10 kN/m^2; ϕ = 330; γ = 17kN/m^3 and those for soil from 3m to 9m include c= 0 kN/m^2; ϕ = 400; γ = 18.50kN/m^3; sub = 20.50kN/m^3. Plot the distribution of active and passive earth pressure and determine the magnitude and point of application of total active and passive earth pressure acting on the retaining wall. [BL: Apply| CO: 3|Marks: 7]

6. (a) Describe in detail various stability conditions that should be checked for the retaining wall. [BL: Understand| CO: 4|Marks: 7]

(b) A gravity retaining wall of height 3 m with uniform thickness (.i.e. rectangular in cross section) of 1.20m is constructed in RRM with a unit weight of 24 kN/m^3. The average properties of soil from top to bottom of wall includes c = 10kN/m^2; ϕ= 30^0. Analyze the stability of wall against overturning when the entire backfill is moist with a unit weight of 18 kN/m^3. [Consider the saturated unit weight in submerged conditions as 9.80kN/m^3].

[BL: Apply| CO: 4|Marks: 7]

MODULE – IV

7. (a) Explain the static method for estimating the load carrying capacity of a single pile driven in cohesive soil. [BL: Understand| CO: 5|Marks: 7]

(b) A continuous footing of width 2.5m rests 1.5m below and ground surface in clay. The unconfined compressive strength of the clay is 150 KN/m^2. Calculate the ultimate bearing capacity of the footing, when there is no effect of water table and when water reaches ground surface. Take γ =18 KN/m^3, γ_{sat} = 20 KN/m^3. [BL: Apply| CO: 5|Marks: 7]

8. (a) Discuss the various types of foundations and their selection with respect to different situations. [BL: Understand| CO: 5|Marks: 7]

(b) A group of 16 piles of 10 m length and 0.5 m diameter is installed in a 10 mthick stiff clay layer underlain by rock. The pile-soil adhesion factor is 0.4. Average shear strength of soil on the sides is 100kPa. Undrained shear strength of soil at the base is also 100 kPa. Calculate the base resistance of a single pile and the group side resistance assuming 100% efficiency of group. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

9. (a) Summarize the following terms in brief: i) Grip length of well foundation ii) Scour depth iii) Dredge level of well foundation. [BL: Understand| CO: 6|Marks: 7]

(b) A circular well of 5m external diameter and staining thickness of 1m is used as foundation for a bridge pier in a sandy stratum. the sub merged unit weight of sand is 1.0t/m^3. And angle of shearing resistance of ϕ = 30^0. The well is subjected to a horizontal force of 50t and a total moment of 500t-m at the sour level. The depth of well to be light, check the lateral stability of the well. [BL: Apply| CO: 6|Marks: 7]

10. (a) How is the load-carrying capacity of an open caisson determined? list the merits and demerits of an open caisson. [BL: Understand| CO: 6|Marks: 7]

(b) A steam turbine with base 6 m x 3.6 m weighs 10,000 kN. It is to be placed on a clay soil with c = 135 kN/m^2. Find the size of the foundation required if the factor of safety is to be 3. The foundation is to be 60 cm below ground surface. [BL: Apply| CO: 6|Marks: 7]

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