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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - FEBRUARY 2022
Regulation: R18
FOUNDATION ENGINEERING

Time: 3 Hours **(CE)** **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) List any four objectives of subsoil exploration. With a neat sketch explain wash boring adopted in soil exploration. **[7M]**

   (b) A seismic refraction study of an area has given in Table 1: **[7M]**

Table 1

Distance from impact point to geophone (m)	15	30	60	90	120
Time to receive wave (s)	0.025	0.05	0.10	0.11	0.12

i) Plot the time travel data and determine the seismic velocity for the surface layer and underlying layer.

ii) Determine the thickness of the upper layer.

2. (a) Explain the procedure to determine SPT value in the field as per IS: 2131-1981. **[7M]**

   (b) Compute the area ratio of a thin walled tube samples having an external diameter of 8cm and a wall thickness of 3.25mm. Do you recommend the sampler for obtaining undisturbed soil samplers? Why? **[7M]**

MODULE – II

3. (a) What is finite slope? Explain the following types of slope failures with sketches: i) Base Failure ii) Toe failure iii) Face (slope) failure. **[7M]**

   (b) An embankment is to be constructed with a soil having the following pre- determined properties: $c = 20kN/m^2$, $\phi = 20^0$,$\gamma = 18kN/m^3$, $F_S = 1.25$ and height is 10m. Estimate side slope required. Taylor's stability numbers are given in Table 2 for various slope angles. Find the factor of safety, if the slope is 1V: 2H given f = 20^0. **[7M]**

Table 2

Slope Angle(^{0})	90	75	60	45	30	20	10
Stability Number	0.182	0.134	0.097	0.062	0.025	0.005	0.0

4. (a) With a neat sketch, explain the stability analysis by Swedish slip circle method for purely cohesive soil and derive the equation for factor of safety. **[7M]**

   (b) Find the factor of safety against sliding along with the interface for the infinite slope shown in Figure 1. Also find the height Z that will give F.S of 2 against sliding along the interface. **[7M]**

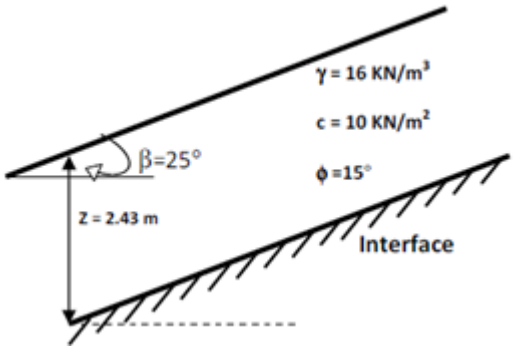

Figure 1

MODULE – III

5. (a) List any four assumptions made in Coulomb's earth pressure theory. Compare any four distinguishing features of Coulomb's earth pressure theory with that of Rankine's theory. **[7M]**

   (b) A gravity retaining wall retains 12 m of a backfill, $\gamma = 17.7kN/m^3$, $\phi = 25^0$ with a uniform horizontal surface. Assume the wall interface to be vertical, determine the magnitude and point of application of the total active pressure. If the water table is a height of 6 m, how far do the magnitude and the point of application of active pressure changed? **[7M]**

6. (a) Enumerate various types of retaining walls with neat sketch. List various stability conditions that should be checked for the retaining wall. **[7M]**

   (b) A retaining wall 4.5 m high with a vertical back supports a horizontal fill weighing $18.60kN/m^3$ and having $\phi = 32^0$ $\delta = 20^0$, and c = 0. Determine the total active thrust on the wall by Culmann's graphical method. **[7M]**

MODULE – IV

7. (a) Illustrate the procedure to conduct plate load test in the field as per IS 1888-1982 guidelines. **[7M]**

   (b) A circular footing is resting on a stiff saturated clay with $q_u = 250kN/m^2$. The depth of foundation is 2m. Determine the diameter of the footing if the column load is 600 kN. Assume a factor of safety as 2.5. The bulk unit weight of soil is $20kN/m^3$. **[7M]**.

8. (a) How is the load-carrying capacity of an open caisson determined? List the merits and demerits of an open caisson. **[7M]**

   (b) A 16-pile group has to be arranged in the form of a square in soft clay with uniform spacing. Neglecting end-bearing, determine the optimum value of the spacing of the piles in terms of the pile diameter, assuming a shear mobilization factor of 0.6. **[7M]**

9. (a) Describe the steps in calculating the soil resistance for well foundation design for sandy soils as per IRC method. Adopt elastic theory method. **[7M]**

   (b) The footing of a column is 2.25 m square and is founded at a depth of 1 m on a cohesive soil of unit weight 17.5 kN/m^3. What is the safe load for this footing if cohesion = $30kN/m^2$; angle of internal friction is zero and factor of safety is 3. Terzaghi's factors for $\phi = 0^0 are N_c = 5.7, N_q = 1$ and $N_\gamma = 0$. **[7M]**

10. (a) Discuss the various forces considered in the design of a well foundation. **[7M]**

    (b) A circular well has an external diameter of 7.5 m and is sunk into a sandy soil to a depth of 20 m below the maximum scour level. The resultant horizontal force is 1800 kN. The well is subjected to a moment of 36,000 kN.m about the maximum scour level due to the lateral force. Determine whether the well is safe against lateral forces, assuming the well to rotate:

    i) About a point above the base

    ii) About the base

    Assume $\gamma^{'}$ = 10 kN/m^3, and$\phi = 36^0$. Use Terzaghi's analysis, and a factor of safety of 2 against passive resistance. **[7M]**

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