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Paper Code : CE(PC)504 Soil Mechanics - II

Time Allotted : 3 Hours *Full Marks :70*

The Figures In the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) Maximum bearing capacity can be expected from ----------rock.

(II) Large settlement in clayey soil will occur when water table ----------

(III) Settlement of raft foundation in comparison to individual footing for same soil pressure is
a) more b) less c) equal d) none of these

(IV) The unit of coefficient of consolidation is ----------

(V) The maximum dry density up to which any soil can be compacted depends upon ---------- and amount of energy.

(VI) Total lateral earth pressure is proportional to ----------of depth of soil.

(VII) The bearing capacity of a soil may be improved by ----------depth of foundation.

(VIII) Settlement due to creep in soils is accidental on ----------
a) primary consolidation b) secondary consolidation c) initial settlement d) compaction settlement

(IX) Write down the formula for Taylor's stability number.

(X) The coefficient of consolidation of a soil is affected by ----------&----------

(XI) To get better strength and stability , the fine grained soils are compacted as -------- of OMC

(XII) The effect of cohesion on a soil is to reduce ---------- inte.sity but increase ---------- intensity

Group-B (Short Answer Type Question)

Answer any three of the following [5 x 3 = 15]

2. Define the factors which affect the compaction process. [5]

3. A wall with smooth vertical back retains a mass of cohesionless soil of 10m height, has horizontal backfill. The backfill soil weighs 21 KN/m^3 and has an angle of internal friction 30^0. Determine the total active earth pressure and its point of application. [5]

4. In a laboratory compaction test on soil the results are found as specific gravity = 2.65, maximum dry density = 1.82 gm/cc, water content = 17%. Determine degree of saturation and air content. [5]

5. A retaining wall 4m high supports backfill of C = 20 KN/m^2, $\varphi = 30^0$, Υ = 20 KN/m^3 with horizontal top surface. The backfill carries a surcharge of 20 KN/m^2. If the wall pushed towards backfill then determine total earth pressure of backfill. [5]

6. Calculate the factor of safety with respect to cohesion of a clay slope laid at 1 in 2 to a height of 10m, if angle of internal friction $\varphi = 10^0$, C = 25 KN/m^2 and Υ = 19 KN/m^3. Also dete mine the critical height of slope in this soil. Consider for $\varphi = 10^0$, if $\beta=30^0$ then $S_n = 0.075$ and if $\beta=15^0$ then $S_n = 0.023$ [5]

Group-C (Long Answer Type Question)

Answer any three of the following [15 x 3 = 45]

7. A retaining wall 6 m high has a smooth vertical back. The horizontal backfill surface is level with top of wall carries a uniformly distributed surcharge of 2.5 T/m^2. The sandy backfill having unit weight 1.7 gm/cc and angle of internal friction 40^0 and top 2 m is unit weight 1.6 gm/cc and angle of internal friction 30^0. Determine total active earth pressure and it's point of application on retaining wall. [12 +3]

8. A retaining wall 2 m in height has a smooth vertical surface. The backfill has a horizontal levelled surface with at top of retaining wall. The density of backfill is 1.8 T/m^2, shearing resistance angle is 30^0 and cohesion is zero. A uniformly distributed surcharge load of 3T/m^2 intensity is acting on the backfill. a) Determine the magnitude and point of application of total active earth pressure. b) If during rainy season, water table rises behind the wall to a height of 1 m above base of wall, determine the effect on value of active earth pressure if there is no change in angle of shearing resistance. Submerged unit weight of backfill is 1.25 T/m^2 [7+8]

9. [10+5]

Mass of mould + mass of wet soil (gm)	2925	3095	3150	3125	3070
Water Content (%)	10.0	12.0	14.3	16.1	18.2

Volume of mould = 1000 ml , Mass of mould = 1000gm. G = 2.7

Define compaction curve showing the optimum moisture content and maximum dry density. Also plot zero air void line.

10. a) A vertical wall, 5 m high supports a saturated cohesive backfill with horizontal surface. The top 3 m of backfill weighs 1.76 gm/cc and has an apparent cohesion of 0.15 kg/cm2. Next 2 m backfill weighs 1.92 gm/ cc and cohesion 0.2 kg/cm2. i)determine depth of tensile crack if it occurs behind the wall ii) Also determine active earth pressure after tensile crack occurrence and it's point of application for top 3 m soil. [8+7]

b) A vertical retaining wall of height 5 m supports a horizontal backfill. The backfill soil 2 m from G.L. consist of clay (C = 10 KN/m^2, $\varphi = 20^0$, Υ = 17 KN/m^3) and rest 3 m consist of sand ($\varphi = 30^0$, Υ = 16 KN/m^3). Here tensile crack occurs up to 2 m from top. Determine total active earth pressure and it's point of application.

11. A rectangular footing of size 1.8 m x 3 m has to transmit the load of a column at depth of 1.5 m. The soil properties are η = 40%, G = 2.67, w = 15%, C = 8 KN/m^2 and φ = 32.5o. Determine safe load by using IS code method. [15]

*** END OF PAPER ***