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[5057]-205

S.E. (Civil) (First Semester) EXAMINATION, 2016

GEOTECHNICAL ENGINEERING

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

- N.B. :—** (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
(ii) Neat diagrams must be drawn wherever necessary.
(iii) Figures to the right indicate full marks.
(iv) Use of calculator is allowed.
(v) Assume suitable data, if necessary.

1. (a) Define coefficient of curvature and uniformity coefficient and state the values of C_u and C_c used to classify the soils. A soil has a plastic limit of 28% and plasticity index of 30%. If natural water content of soil is 32%, what is the liquidity and consistency index ? [6]

- (b) Derive the expression for coefficient of permeability of soil for falling head method. [6]

Or

2. (a) Derive the relation between γ_d , G , w and n_a . [6]
(b) What do you understand by critical hydraulic gradient ? Derive the expression for the same. [6]

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3. (a) Define pressure bulb and write down its significance.

A concentration load of 40 kN acts on the surface of homogeneous soil mass of large extent. Find the stress intensity at a depth of 10 meters by using Boussinesq's theory at a horizontal distance of 5.0 m. [6]

- (b) Explain direct shear test with respect to the drainage and loading conditions. [6]

Or

4. (a) A cohesive soil has an angle of shearing of 15° and cohesion of 35 kN/m^2 . If the specimen of this soil is subjected to triaxial compression test, find the value of cell pressure in the cell for failure to occur at a total stress of 300 kN/m^2 . [6]

- (b) Explain the factors affecting compaction of soil with neat sketches. [6]

5. (a) Explain Active, Passive and At rest pressure. Derive the expression for coefficient of earth pressure at rest. [6]

- (b) Compute the active earth pressure at a depth of 4.0 m in sand whose angle of friction is 35° and density is 15.1 kN/m^3 in dry state. Also compute the active earth pressure if the water table rises to the ground level. Assume saturated unit wt. of soil 22 kN/m^3 . [7]

Or

6. (a) Explain Coulomb wedge theory for determination of earth pressure. [6]
- (b) A vertical excavation was made in a clay deposit having weight of 20 kN/m^3 . It caved in after depth of digging reached 4 m. Taking the angle of internal friction zero calculate the value of cohesion. If the same clay is used as a backfill against a retaining wall up to height of 8 m, calculate total active earth pressure and total passive earth pressure. [7]
7. (a) What is geochemical attenuation capacity of soil ? Explain role of soil as a geochemical trap. [6]
- (b) A cutting 5m deep is made in a clay at a slope of 45° . The bulk-density of clay is 18.2 kNm^3 and the angle of shearing resistance is 10° . What is the value of cohesion necessary to give a factor of safety of 1.5 with respect to cohesion? [7]

Or

8. (a) Calculate the factor of safety with respect to cohesion of a clay slope laid 1 in 2 to a height of 10 m if the angle of internal friction is 10° , $c = 25 \text{ kN/m}^2$ and $\gamma = 19 \text{ kN/m}^3$. What will be the critical height of the slope in this soil ? Assume $S_n = 0.064$ for $\phi = 10^\circ$ and the given slope. [7]

(b) What would be the type of subsurface contamination if the following wastes are dumped on ground surface in a low lying area : [6]

(i) Sludge from effluent treatment plant of a chrome-plating unit.

(ii) Ash i.e., residue obtained after burning of waste in an incineration plant

(iii) Overburden excavated during mining of coal ?