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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  $\gamma_d$ ,  $G$ ,  $w$  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  $15^\circ$  and cohesion of  $35 \text{ kN/m}^2$ . 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  $300 \text{ kN/m}^2$ . [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  $35^\circ$  and density is  $15.1 \text{ kN/m}^3$  in dry state. Also compute the active earth pressure if the water table rises to the ground level. Assume saturated unit wt. of soil  $22 \text{ kN/m}^3$ . [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  $20 \text{ kN/m}^3$ . 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  $45^\circ$ . The bulk-density of clay is  $18.2 \text{ kNm}^3$  and the angle of shearing resistance is  $10^\circ$ . 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  $10^\circ$ ,  $c = 25 \text{ kN/m}^2$  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 ?

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