

5E5063	Roll No. _____	Total No. of Pages : 4
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	B. Tech. V-Sem. (Main & Back) Exam; Nov./Dec. 2018 Civil Engg. SCEA Geotechnical Engg.	

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit.

- All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly).
Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. _____ NIL _____ 2. _____ NIL _____

Unit - I

(a)

What is the definition of soil mechanics ? Why each problem in soil engineering is a unique problem? What are the index properties of coarse and fine grained soils? Explain in brief.

(b)

Derive relationship between bulk unit weight, specific gravity, void ratio and degree of saturation. Also write the expression for dry unit weight and saturated unit weight.

OR

- 1 (a) What is soil classification? Draw plasticity chart as per Indian Soil Classification Systems. Give explanation of different symbols used in the chart.
- (b) What is particle size distribution curve? How soil can be classified based on the particle size distribution curve ?

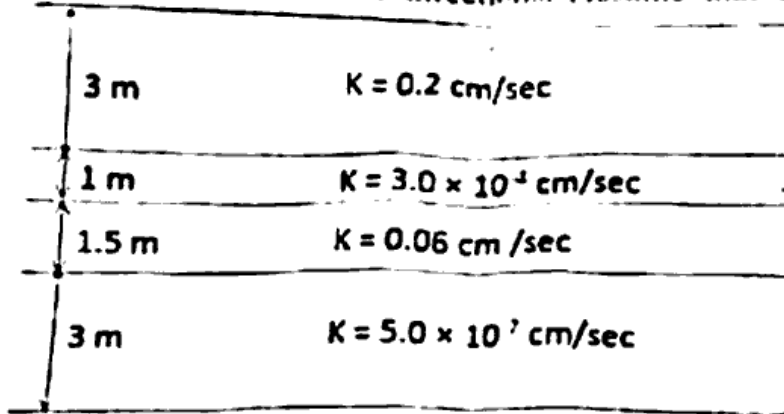
An air dry soil sample weighing 1.0 kg was sieved in a laboratory. The mass of soil retained on different sieves are given below :

IS Sieve	4.75 mm	2.0 mm	600 μ	425 μ	300 μ	212 μ	150 μ	75 μ
Mass retained (gm)	50	78	90	150	160	132	148	179

Determine the percentage finer than the corresponding sizes.

Unit - II

- 2 (a) Discuss the construction and characteristics of Kaolinite and Montmorillonite mineral groups in brief.
(b) The following figure shows a x-section through the strata underlying a site. Calculate the equivalent permeability of the layered system in the vertical and horizontal directions. Assume that each layer is isotropic.



OR

- 2 (a) What are the different types of soil water? Describe in brief. Also discuss the phenomenon of capillary rise in soils in brief.
(b) During a pumping test, a well was sunk through a stratum of dense sand 10 m deep overlying an impervious stratum. Observation holes were drilled at 15 m and 6.75 m from the well. Initially the water level in the well was 2.5 m below the ground surface. After pumping until steady conditions had been achieved, the water levels in the observation wells had dropped 1.95 m and 0.50 m, respectively. If the steady discharge was 5 liters/sec, determine the coefficient of permeability.

Unit - III

- 3 (a) Define total stress, neutral stress and effective stress. What is the quick sand condition?
(b) A soil profile consists of a surface layer of clay 4 m thick ($\gamma = 19.5 \text{ kN/m}^3$) and a sand layer 2 m thick ($\gamma = 18.5 \text{ kN/m}^3$) overlying an impermeable rock. The W.T. is at the ground surface. If the water level in a stand pipe driven into the sand layer rises 2 m above the ground surface. Draw the plot showing the variation of σ , u and σ' . Take $\gamma_w = 10 \text{ kN/m}^3$.

OR

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[P.T.O.

- 3 (a) Prove that the discharge through the earth mass is given by $q = k \cdot \frac{h}{N_d} \cdot N_f$.

Determine the discharge through the foundation of an earth dam if the flow net has 10 equipotential drops and 3.5 flow channels. The length of the dam is 300 m and the coefficient of permeability of the soil is 2.5×10^{-4} cm/sec. The level of water above the base of the dam is 12 m on upstream and 4 m on downstream.

- (b) With the help of schematic diagram of flow field, describe the characteristics of flow net.

Unit - IV

- 4 (a) Illustrating the significance of both the stages of a tri-axial test, define UU, CU and CD tests.

- (b) A sample of dry cohesionless soil was tested in a triaxial machine. If the angle of shearing resistance was 36° and the confining pressure 100 kN/m^2 , determine the deviator stress at which the sample failed.

OR

- (a) What is Mohr-Coulomb theory for soils? Sketch Mohr-Coulomb failure envelop.
- (b) A series of shear tests were performed on a soil. Each test was carried out until the soil sample failed and the principle stresses for each test were as follows.

Test	$\sigma_3 \text{ (kN/m}^2\text{)}$	$\sigma_1 \text{ (kN/m}^2\text{)}$
1	300	875
2	400	1160
3	500	1460

Plot the Mohr circle of stress and determine the strength envelope and angle of internal friction of the soil.

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Unit - V

5 (a) The following results were obtained from a standard compaction test on a sample of soil.

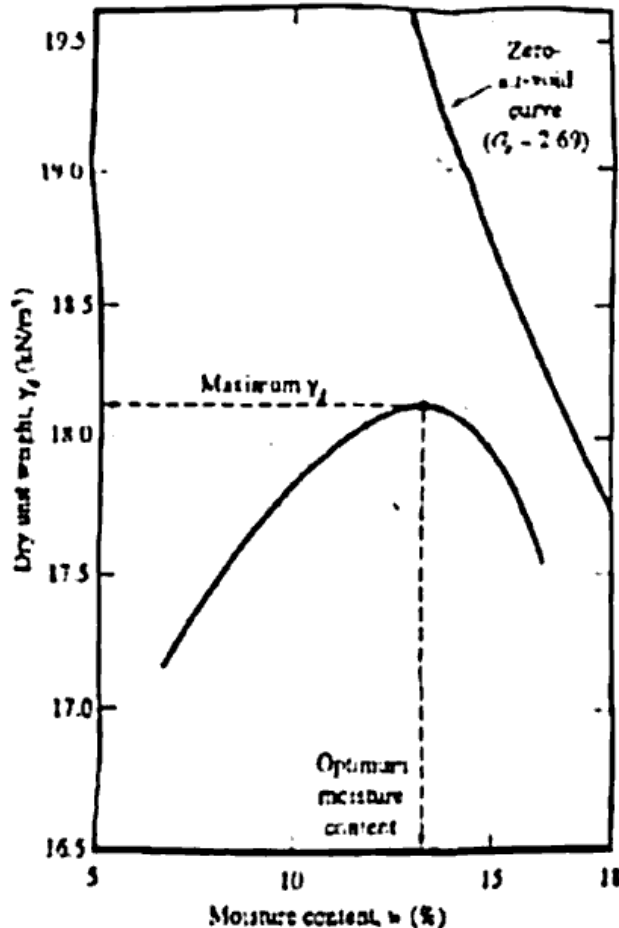
Water Content (%)	0.12	0.14	0.16	0.18	0.20	0.22
Mass of moist soil (kg)	1.68	1.85	1.91	1.87	1.87	1.85

The volume of mould used was 1000 ml. Make necessary calculations to plot the compactive curve and from the plot obtain the M.D.D. & the O.M.C.

(b) What is mechanical stabilization? What are the factors that affect the mechanical stability of a mixed soil?

OR

5 (a) From the given figure, if a fill is needed to be compacted at 90% compactive effort, 2% dry of optimum, calculate the in-place density of the fill.



(b) What is soil stabilization? What are its uses?