Course Code: 19CE0117 **R19**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583
QUESTION BANK (DESCRIPTIVE)

Subject with Code: Geotechnical Engineering (19CE0117) **Course & Branch**: B.Tech - CE

Regulation: R19 **Year & Sem:** III-B.Tech & I-Sem

UNIT –I
INTRODUCTION, PERMEABILITY &EFFECTIVE STRESS ANALYSIS

1	Explain the process of soil formation by weathering in details.	**[L2][CO1]**	**[12M]**
2	a) Classify various types of soil structures with neat sketch. b) Explain Clay mineralogy.	**[L2][CO1]** **[L2][CO1]**	**[6M]** **[6M]**
3	a) Using three phase diagram of soil, develop an expression for Void ratio, water content, specific gravity and degree of saturation. b) The moist unit weight of soil sample is 19.2 kN/m^3 and has water content of 9.8%. The specific gravity of soil particles is 2.69. Determine dry unit weight, void ratio and porosity and degree of saturation.	**[L2][CO1]** **[L3][CO1]**	**[6M]** **[6M]**
4	a) Write short notes on Index Properties of soils. b) Explain in detail the laboratory method for particle size distribution of coarse grained soils by dry sieve analysis.	**[L1][CO1]** **[L2][CO1]**	**[6M]** **[6M]**
5	Explain in detail the Indian Standard classification System and list out group symbols in detail.	**[L2][CO1]**	**[6M]**
6	Define Atterberg Limits.Explain the procedure of Liquid limit of soil.	**[L2][CO2]**	**[12M]**
7	Define permeability. Explain various factors affecting permeability.	**[L2][CO2]**	**[12M]**
8	Determine the average coefficient of permeability in the horizontal and vertical direction for a deposit consisting of three layers of thickness 5m, 1m, and 2.5m and having the coefficient of permeability of 3 x10^{-2} mm/sec, 3x10^{-5}mm/sec and 4 x10^{-2}mm/sec respectively.	**[L3][CO2]**	**[12M]**
9	Explain the coefficient of permeability in laboratory by constant head method with neat sketch.	**[L2][CO2]**	**[12M]**
10	a) Explain Quick sand condition. b) Define flow net and various applications of flow net.	**[L2][CO2]** **[L2][CO2]**	**[6M]** **[6M]**

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UNIT –II
COMPACTION AND CONSOLIDATION

1	Describe the Standard Proctor test and modified Proctor test to be conducted in the laboratory.	**[L2][CO3]**	**[12M]**
2	Define compaction and explain various factors effecting the compaction.	**[L2][CO3]**	**[12M]**
3	Write short notes on (i) Compaction phenomenon (ii) Method of compaction	 **[L1][CO3]** **[L1][CO3]**	 **[6M]** **[6M]**
4	Explain the procedure of Core Cutter method with neat sketch.	**[L2][CO3]**	**[12M]**
5	a) The Maximum dry density of a sample by the light compaction test is 1.78g/ml at an optimum water content of 15%. Find the air voids and degree of saturation G=2.67.What would be the corresponding value of dry density on the zero air voids at optimum moisture content. b) An earth embankment is compacted at a water content 18%.to a bulk density of 19.2 kN/m^3. If the specific gravity of the sand is 2.7 find the void ratio and the degree of saturation of compacted embankment.	**[L3][CO3]** **[L3][CO3]**	**[6M]** **[6M]**
6	Explain the procedure of Sand replacement method with neat sketch.	**[L2][CO3]**	**[12M]**
7	Define consolidation and various types of consolidations.	**[L2][CO3]**	**[12M]**
8	(a) Define preconsolidation pressure. (b) Draw the graph representing preconsolidation pressure.	**[L2][CO3]** **[L2][CO3]**	**[6M]** **[6M]**
9	Explain the procedure of consolidation test with neat sketch.	**[L2][CO3]**	**[12M]**
10	In a consolidation test the following results have been obtained. When the load was changed from 50 kN/m^2 to 100 kN/m^2, the void ratio changed from 0.70 to 0.65. Determine compression index, coefficient of volume change and coefficient of consolidation in mm^2/sec.	**[L3][CO3]**	**[12M]**

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UNIT –III
STRESS DISTRIBUTION IN SOILS AND SHEAR STRENGTH OF SOILS

1	Develop an expression for the vertical stress at a point due to a point load, using Boussinesq's theory.	**[L2][CO4]**	**[12M]**
2	Explain Newmaark's influence chart with neat sketch.	**[L2][CO4]**	**[12M]**
3	a) A concentrated load of 2000 kN acts vertically at the ground surface. Determine the vertical stress at a point P which is 6m directly below the load. Also calculate the vertical stress at a point R which is at a depth of 6m but at a horizontal distance of 5m from the axis of the load. b) Determine the vertical stress at a point P which is 3m below and at a radial distance of 3m from the vertical load 100kN. Use westergaard's solution.	**[L3][CO4]** **[L3][CO4]**	**[6M]** **[6M]**
4	Explain vertical stress under line load, strip load, circular load and rectangular area with neat sketch.	**[L1][CO4]**	**[12M]**
5	(a) Explain the concept of 'Westergaards theory' in soils. (b) What do you understand by 'Pressure bulb'? Illustrate with sketches.	**[L2][CO4]** **[L2][CO4]**	**[6M]** **[6M]**
6	Write brief critical notes on: (a) Mohr's Circle of stress. (b) Explain the Mohr-Coulomb strength theory.	 **[L1][CO4]** **[L2][CO4]**	 **[6M]** **[6M]**
7	a) Explain types of soils based on total strength. b) Explain types of shear strength based on drainage conditions.	**[L2][CO4]** **[L2][CO4]**	**[6M]** **[6M]**
8	Explain the principle of the direct shear test. What are the advantages of this test? What are its Limitations.	**[L2][CO4]**	**[12M]**
9	Describe the vane shear test with neat a sketch.	**[L2][CO4]**	**[12M]**
10	Explain the procedure of unconfined compression test with neat sketch.	**[L2][CO4]**	**[12M]**

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UNIT –IV
EARTH SLOPE STABILITY

1	(a) Define earth slope. (b) Explain factor of safety with respect to shear strength, cohesion and friction.	**[L1][CO5]** **[L2][CO5]**	**[6M]** **[6M]**
2	(a) What are the factors causes the slope failures. (b) Explain different types of slope failures with neat sketches.	**[L1][CO5]** **[L1][CO5]**	**[6M]** **[6M]**
3	Derive the expression for stability analysis of infinite slope of cohesive soils.	**[L2][CO5]**	**[12M]**
4	Derive the expression for stability analysis of infinite slope of cohesion less soils	**[L2][CO5]**	**[12M]**
5	(a) Explain Taylor's stability number. (b) A vertical cut is made is made in a clay deposit (c=30 kN/m^2, $\Phi' = 0^o$,γ=16 kN/m^2). Find the maximum height which can be temporarily supported. Take S_n=0.261.	**[L2][CO5]** **[L3][CO5]**	**[6M]** **[6M]**
6	With the help of a neat sketch explain in detail about friction circle method.	**[L2][CO5]**	**[12M]**
7	A canal is to be excavated through a soil with c = 15 kN/m^2, $\Phi = 20^o$, e = 0.9 and G = 2.67. The side slope is 1 in 1. The depth of the canal is 6 m. determine the factor of safety with respect to cohesion when the canal runs full. What will be the factor of safety if the canal is rapidly emptied.	**[L3][CO5]**	**[12M]**
8	Analyze the slope, if it is made of clay having c' = 30 kN/m^2, $\Phi' = 20^o$, e = 0.65 and G = 2.67 and under the following conditions: (i) When the soil is dry (ii) When water seeps parallel to the surface of the slope (iii) When the slope is submerged slope angle = 25^o	**[L3][CO5]**	**[12M]**
9	Give the step by step procedure of analyzing stability of a finite slope using Swedish circle method.	**[L2[CO5]**	**[12M]**
10	With the help of a neat sketch show various forces considered for the analysis of a finite slope using Bishop's simplified method. Mention the equation for factor of Safety given by this method.	**[L2][CO5]**	**[12M]**

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UNIT –V
SOIL EXPLORATION

1	(a) What are the different stages in sub soil exploration? (b) Explain various uses of site investigations.	**[L1][CO6]** **[L2][CO6]**	**[6M]** **[6M]**
2	Describe with a neat sketch how will you carry out the wash boring method of soil exploration.	**[L2][CO6]**	**[12M]**
3	(a) Discuss various open excavation methods for conducting soil exploration. (b)Sketch scraper bucket sample and explain how an undisturbed soil sample is extracted using it.	**[L2][CO6]** **[L2][CO6]**	**[6M]** **[6M]**
4	(a) How boring operations are carried out using rotary auger boring and percussion drilling. (b) Describe the construct of a split spoon sampler. Explain how undisturbed soil sample is extracted using it.	**[L2][CO6]** **[L2][CO6]**	**[6M]** **[6M]**
5	(a) Explain various types of soil samples. (b) List out various design features affecting the sample disturbance.	**[L2][CO6]** **[L1][CO6]**	**[6M]** **[6M]**
6	Give a detailed account on how Standard Penetration Test is conducted. What are the relevant corrections applied to SPT number?	**[L2][CO6]**	**[12M]**
7	a) A SPT was conducted in fine sand below the water table and a value of 25 is obtained for N. What is the corrected value of N. b) A SPT was conducted in a dense sand deposit at a depth of 22m and a value of 48 was observed for N. The density of the sand was 15 kN/m^2 .What is the value of N corrected for over burden pressure.	**[L1][CO6]** **[L1][CO6]**	**[6M]** **[6M]**
8	Explain in detail how cone penetration test is conducted with neat sketch.	**[L2][CO6]**	**[12M]**
9	(a) Describe in detail execution of soil exploration program. (b) Explain various salient features of a soil exploration report	**[L2][CO6]** **[L2][CO6]**	**[6M]** **[6M]**
10	Explain in detail how plate load Test is conducted with neat sketch.	**[L2][CO6]**	**[12M]**

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