



**SIDDHARTH GROUP OF INSTITUTIONS:: PUTTUR  
(AUTONOMOUS)**

Siddharth Nagar, Narayanavanam Road – 517583

**QUESTION BANK (DESCRIPTIVE)**

**Subject with Code:** Geotechnical Engineering

**Course & Branch:** B.Tech - CE

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

**Regulation:** R18

**UNIT –I**

**INTRODUCTION , PERMEABILITY &EFFECTIVE STRESS ANALYSIS**

<b>1</b>	<b>a</b>	Define (i) Porosity (ii) Degree of Saturation (iii)Relative Density	[L1][CO1]	[2M]
	<b>b</b>	State Darcy's law.	[L1][CO2]	[2M]
	<b>c</b>	Define (i) Discharge velocity (ii) Seepage velocity.	[L1][CO2]	[2M]
	<b>d</b>	Define the terms: (i) Effective stress (ii) Neutral stress (iii) Total stress.	[L1][CO2]	[2M]
	<b>e</b>	What is the critical gradient of a sand deposit of specific gravity 2.65 and void ratio 0.5?	[L1][CO2]	[2M]
<b>2</b>		Explain the process of soil formation by weathering in details.	[L2][CO1]	[10M]
<b>3</b>	a)	Classify various types of soil structures with neat sketch.	[L2][CO1]	[5M]
	b)	Explain Clay mineralogy.	[L2][CO1]	[5M]
<b>4</b>	a)	Using three phase diagram of soil, develop an expression for Void ratio, water content, specific gravity and degree of saturation.	[L2][CO1]	[5M]
	b)	The moist unit weight of soil sample is 19.2 kN/m <sup>3</sup> 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.	[L3][CO1]	[5M]
<b>5</b>	a)	What are consistency limits explain with graph.	[L1][CO1]	[5M]
	b)	Explain in detail the laboratory method of liquid limit.	[L2][CO1]	[5M]
<b>6</b>	a)	Write short notes on Index Properties of soils.	[L1][CO1]	[4M]
	b)	Explain in detail the laboratory method of dry sieve analysis of coarse grained soils?	[L2][CO1]	[6M]
<b>7</b>		Explain in detail the Indian Standard classification System and list out group symbols in detail?	[L2][CO1]	[10M]
<b>8</b>		Define permeability? Explain various factors affecting permeability?	[L2][CO2]	[10M]
<b>9</b>		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 $3 \times 10^{-2}$ mm/sec, $3 \times 10^{-5}$ mm/sec and $4 \times 10^{-2}$ mm/sec respectively.	[L3][CO2]	[10M]
<b>10</b>		Explain the coefficient of permeability in laboratory by constant head method with neat sketch.	[L2][CO2]	[10M]
<b>11</b>	a)	Explain Quick sand condition?	[L2][CO2]	[5M]
	b)	Define flow net and various applications of flow net.	[L2][CO2]	[5M]

**UNIT –II**  
**COMPACTION AND CONSOLIDATION**

<b>1</b>	<b>a</b>	Write short notes on zero air void line.	[L1][CO3]	[2M]
	<b>b</b>	Define relative compaction.	[L1][CO3]	[2M]
	<b>c</b>	Coefficient of compressibility.	[L1][CO3]	[2M]
	<b>d</b>	Coefficient of volume change	[L1][CO3]	[2M]
	<b>e</b>	Compression index, Expansion index & Recompression index	[L1][CO3]	[2M]
<b>2</b>	Describe the Standard Proctor test and modified Proctor test to be conducted in the laboratory.		[L2][CO3]	[10M]
<b>3</b>	Define compaction and explain various factors effecting the compaction?		[L2][CO3]	[10M]
<b>4</b>	Write short notes on			
	(i)	Compaction phenomenon	[L1][CO3]	[5M]
	(ii)	Method of compaction	[L1][CO3]	[5M]
<b>5</b>	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.		[L3][CO3]	[5M]
	b) An earth embankment is compacted at a water content 18%. to a bulk density of $19.2 \text{ kN/m}^3$ . If the specific gravity of the sand is 2.7 find the void ratio and the degree of saturation of compacted embankment.		[L3][CO3]	[5M]
<b>6</b>	Explain the procedure of Sand replacement method with neat sketch.		[L2][CO3]	[10M]
<b>7</b>	Explain the procedure of Core Cutter method with neat sketch.		[L2][CO3]	[10M]
<b>8</b>	Define consolidation and various types of consolidations.		[L2][CO3]	[10M]
<b>9</b>	(a) Define preconsolidation pressure.		[L2][CO3]	[5M]
	(b) Draw the graph representing preconsolidation pressure.		[L2][CO3]	[5M]
<b>10</b>	Explain the procedure of consolidation test with neat sketch		[L2][CO3]	[10M]
<b>11</b>	In a consolidation test the following results have been obtained. When the load was changed from $50 \text{ kN/m}^2$ to $100 \text{ kN/m}^2$ , the void ratio changed from 0.70 to 0.65. Determine compression index, coefficient of volume change and coefficient of consolidation in $\text{mm}^2/\text{sec}$ .		[L3][CO3]	[10M]

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

<b>1</b>	<b>a</b>	Write short notes on stress distribution in soil.	[L1][CO4]	[2M]
	<b>b</b>	Define equation for vertical stress under a corner of rectangular area.	[L1][CO4]	[2M]
	<b>c</b>	List out various assumptions of Boussinesq's equation.	[L1][CO4]	[2M]
	<b>d</b>	What are the constituents on which shear strength of soil depends upon?	[L1][CO4]	[2M]
	<b>e</b>	List out any two advantages and disadvantages of vane shear test?	[L1][CO4]	[2M]
<b>2</b>	Develop an expression for the vertical stress at a point due to a point load, using Boussinesq's theory		[L2][CO4]	[10M]
<b>3</b>	Explain Newmark's influence chart with neat sketch.		[L2][CO4]	[10M]
<b>4</b>	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.		[L3][CO4]	[5M]
	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]	[5M]
<b>5</b>	Explain vertical stress under line load, strip load, circular load and rectangular area		[L1][CO4]	[10M]
<b>6</b>	(a) Explain the concept of 'Westergaards theory' in soils.		[L2][CO4]	[5M]
	(b) What do you understand by 'Pressure bulb'? Illustrate with sketches.		[L2][CO4]	[5M]
<b>7</b>	Write brief critical notes on:			
	(a) Mohr's Circle of stress.		[L1][CO4]	[5M]
	(b) Explain the Mohr-Coulomb strength theory.		[L2][CO4]	[5M]
<b>8</b>	a) Explain types of soils based on total strength.		[L2][CO4]	[5M]
	b) Explain types of shear strength based on drainage conditions.		[L2][CO4]	[5M]
<b>9</b>	Explain the principle of the direct shear test. What are the advantages of this test? What are its Limitations?		[L2][CO4]	[10M]
<b>10</b>	Describe the vane shear test with neat a sketch.		[L2][CO4]	[10M]
<b>11</b>	Explain the procedure of Triaxial Test with neat sketch.		[L2][CO4]	[10M]

**UNIT –IV**  
**EARTH SLOPE STABILITY**

<b>1</b>	<b>a</b>	Write short notes on earth slope stability.	[L1][CO5]	[2M]
	<b>b</b>	Explain compound failure with neat sketch.	[L1][CO5]	[2M]
	<b>c</b>	Mention various uses of Taylor's stability number	[L1][CO5]	[2M]
	<b>d</b>	What are the forces considered in Bishop's simplified method	[L1][CO5]	[2M]
	<b>e</b>	List out various types of slope failures.	[L1][CO5]	[2M]
<b>2</b>	(a)	Define earth slope?	[L1][CO5]	[5M]
	(b)	Explain factor of safety with respect to shear strength, cohesion and friction?	[L2][CO5]	[5M]
<b>3</b>	(a)	What are the factors causes the slope failures?	[L1][CO5]	[5M]
	(b)	Explain different types of slope failures with neat sketches	[L1][CO5]	[5M]
<b>4</b>		Derive the expression for stability analysis of infinite slope of cohesive soils.	[L2][CO5]	[10M]
<b>5</b>		Derive the expression for stability analysis of infinite slope of cohesionless soils.	[L2][CO5]	[10M]
<b>6</b>	(a)	Explain Taylor's stability number?	[L2][CO5]	[5M]
	(b)	A vertical cut is made in a clay deposit ( $c=30 \text{ kN/m}^2$ , $\Phi' = 0^\circ$ , $\gamma=16 \text{ kN/m}^2$ ). Find the maximum height which can be temporarily supported. Take $S_n=0.261$	[L3][CO5]	[5M]
<b>7</b>		With the help of a neat sketch explain in detail about friction circle method?	[L2][CO5]	[10M]
<b>8</b>		A canal is to be excavated through a soil with $c = 15 \text{ kN/m}^2$ , $\Phi = 20^\circ$ , $e = 0.9$ 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]	[10M]
<b>9</b>		Analyze the slope, if it is made of clay having $c' = 30 \text{ kN/m}^2$ , $\Phi' = 20^\circ$ , $e = 0.65$ 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 = $25^\circ$	[L3][CO5]	[10M]
<b>10</b>		Give the step by step procedure of analyzing stability of a finite slope using Swedish circle method.	[L2][CO5]	[10M]
<b>11</b>		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]	[10M]

**UNIT –V**  
**SOIL EXPLORATION**

<b>1</b>	<b>a</b>	Write short notes on Soil exploration.	[L1][CO6]	[2M]
	<b>b</b>	Write short notes on core drilling.	[L1][CO6]	[2M]
	<b>c</b>	List out various types of soil samplers.	[L1][CO6]	[2M]
	<b>d</b>	What are hand carved samplers.	[L1][CO6]	[2M]
	<b>e</b>	List out various types of borings for soil exploration.	[L1][CO6]	[2M]
<b>2</b>	(a)	What are the different stages in sub soil exploration?	[L1][CO6]	[5M]
	(b)	Explain various uses of site investigations.	[L2][CO6]	[5M]
<b>3</b>		Describe with a neat sketch how will you carry out the wash boring method of soil exploration.	[L2][CO6]	[10M]
<b>4</b>	(a)	Discuss various open excavation methods for conducting soil exploration.	[L2][CO6]	[5M]
	(b)	Sketch scraper bucket sample and explain how an undisturbed soil sample is extracted using it.	[L2][CO6]	[5M]
<b>5</b>	(a)	How boring operations are carried out using rotary auger boring and percussion drilling?	[L2][CO6]	[5M]
	(b)	Describe the construct of a split spoon sampler. Explain how undisturbed soil sample is extracted using it.	[L2][CO6]	[5M]
<b>6</b>	(a)	Explain various types of soil samples.	[L2][CO6]	[5M]
	(b)	List out various design features affecting the sample disturbance.	[L1][CO6]	[5M]
<b>7</b>		Give a detailed account on how Standard Penetration Test is conducted. What are the relevant corrections applied to SPT number?	[L2][CO6]	[10M]
<b>8</b>		Explain in detail how Cone Penetration Test is conducted with neat sketch.	[L2][CO6]	[10M]
<b>9</b>	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?	[L1][CO6]	[5M]
	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 <sup>2</sup> . What is the value of N corrected for over burden pressure?	[L1][CO6]	[5M]
<b>10</b>	(a)	Describe in detail execution of soil exploration program.	[L2][CO6]	[5M]
	(b)	Explain various salient features of a soil exploration report	[L2][CO6]	[5M]
<b>11</b>		Explain in detail how plate load Test is conducted with neat sketch.	[L2][CO6]	[10M]

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