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

1	**a**	Define (i) Porosity (ii) Degree of Saturation (iii)Relative Density	[L1][CO1]	**[2M]**
	b	State Darcy's law.	[L1][CO2]	**[2M]**
	c	Define (i) Discharge velocity (ii) Seepage velocity.	[L1][CO2]	**[2M]**
	d	Define the terms: (i) Effective stress (ii) Neutral stress (iii) Total stress.	[L1][CO2]	**[2M]**
	e	What is the critical gradient of a sand deposit of specific gravity 2.65 and void ratio 0.5?	[L1][CO2]	**[2M]**
2		Explain the process of soil formation by weathering in details.	[L2][CO1]	**[10M]**
3		a) Classify various types of soil structures with neat sketch.	[L2][CO1]	**[5M]**
		b) Explain Clay mineralogy.	[L2][CO1]	**[5M]**
4		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^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.	[L3][CO1]	**[5M]**
5		a) Write short notes on Index Properties of soils.	[L1][CO1]	**[5M]**
		b) Explain in detail the laboratory method for particle size distribution of coarse grained soils by dry sieve analysis.	[L2][CO1]	**[5M]**
6		Explain in detail the Indian Standard classification System and list out group symbols in detail.	[L2][CO1]	**[10M]**
7		Define permeability. Explain various factors affecting permeability.	[L2][CO2]	**[10M]**
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]	**[10M]**
9		Explain the coefficient of permeability in laboratory by constant head method with neat sketch.	[L2][CO2]	**[10M]**
10		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

1	a	Write short notes on zero air void line.	[L1][CO3]	**[2M]**
	b	Define relative compaction.	[L1][CO3]	**[2M]**
	c	Coefficient of compressibility.	[L1][CO3]	**[2M]**
	d	Coefficient of volume change	[L1][CO3]	**[2M]**
	e	Compression index, Expansion index &Recompression index	[L1][CO3]	**[2M]**
2		Describe the Standard Proctor test and modified Proctor test to be conducted in the laboratory.	[L2][CO3]	**[10M]**
3		Define compaction and explain various factors effecting the compaction.	[L2][CO3]	**[10M]**
4		Write short notes on (i) Compaction phenomenon (ii) Method of compaction	[L1][CO3] [L1][CO3]	**[5M]** **[5M]**
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.	[L3][CO3]	**[5M]**
		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]	**[5M]**
6		Explain the procedure of Sand replacement method with neat sketch.	[L2][CO3]	**[10M]**
7		Define consolidation and various types of consolidations.	[L2][CO3]	**[10M]**
8		(a) Define preconsolidation pressure. (b) Draw the graph representing preconsolidation pressure.	[L2][CO3] [L2][CO3]	**[5M]** **[5M]**
9		Explain the procedure of consolidation test with neat sketch.	[L2][CO3]	**[10M]**
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]	**[10M]**

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

1	a	Write short notes on stress distribution in soil.	[L1][CO4]	**[2M]**
	b	Define equation for vertical stress under a corner of rectangular area.	[L1][CO4]	**[2M]**
	c	List out various assumptions of Boussinesq's equation.	[L1][CO4]	**[2M]**
	d	What are the constituents on which shear strength of soil depends upon.	[L1][CO4]	**[2M]**
	e	List out any two advantages and disadvantages of vane shear test.	[L1][CO4]	**[2M]**
2		Develop an expression for the vertical stress at a point due to a point load, using Boussinesq's theory.	[L2][CO4]	**[10M]**
3		Explain Newmaark's influence chart with neat sketch.	[L2][CO4]	**[10M]**
4		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]**
5		Explain vertical stress under line load, strip load, circular load and rectangular area with neat sketch.	[L1][CO4]	**[10M]**
6		(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]**
7		Write brief critical notes on:		
		(a) Mohr's Circle of stress.	[L1][CO4]	**[5M]**
		(b) Explain the Mohr-Coulomb strength theory.	[L2][CO4]	**[5M]**
8		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]**
9		Explain the principle of the direct shear test. What are the advantages of this test? What are its Limitations.	[L2][CO4]	**[10M]**
10		Describe the vane shear test with neat a sketch.	[L2][CO4]	**[10M]**

UNIT –IV
EARTH SLOPE STABILITY

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

UNIT –V
SOIL EXPLORATION

1	a	Write short notes on Soil exploration.	[L1][CO6]	**[2M]**
	b	Write short notes on core drilling.	[L1][CO6]	**[2M]**
	c	List out various types of soil samplers.	[L1][CO6]	**[2M]**
	d	What are hand carved samplers.	[L1][CO6]	**[2M]**
	e	List out various types of borings for soil exploration.	[L1][CO6]	**[2M]**
2		(a) What are the different stages in sub soil exploration?	[L1][CO6]	**[5M]**
		(b) Explain various uses of site investigations.	[L2][CO6]	**[5M]**
3		Describe with a neat sketch how will you carry out the wash boring method of soil exploration.	[L2][CO6]	**[10M]**
4		(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]**
5		(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]**
6		(a) Explain various types of soil samples.	[L2][CO6]	**[5M]**
		(b) List out various design features affecting the sample disturbance.	[L1][CO6]	**[5M]**
7		Give a detailed account on how Standard Penetration Test is conducted. What are the relevant corrections applied to SPT number?	[L2][CO6]	**[10M]**
8		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^2 .What is the value of N corrected for over burden pressure.	[L1][CO6]	**[5M]**
9		(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]**
10		Explain in detail how plate load Test is conducted with neat sketch.	[L2][CO6]	**[10M]**

Prepared by:
Mr.D.SREEKANTH
Asst Professor/CE