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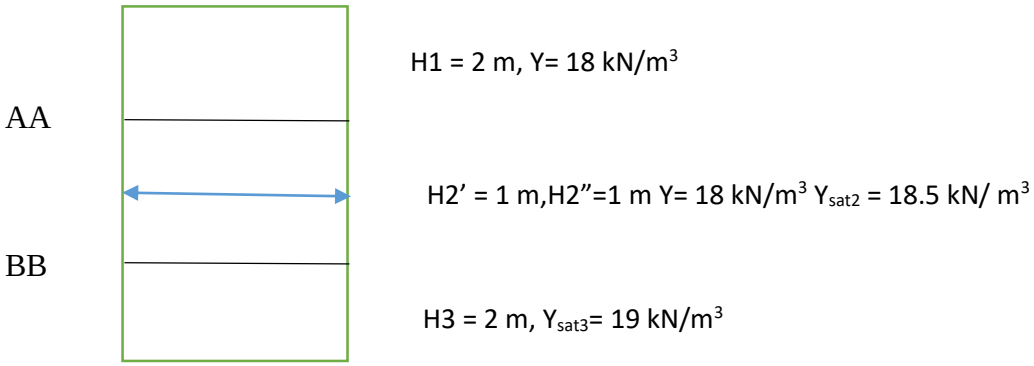
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Geotechnical Engineering **Semester: V**
Program: B Tech Civil Engineering **Time: 03 hrs.**
Course Code: CIVL 3020 **Max. Marks: 100**

Instructions: Answer all the question of a section at the same place.

SECTION A (Q5x4=20) Answer all questions

S. No.		Marks	CO
Q 1	Define saturated unit weight of soil.	**4**	**CO1**
Q 2	Differentiate between falling and sliding of soil with sketches.	**4**	**CO2**
Q 3	Fill in the blanks. Sandy soils are known to have _____ permeability. Clayey soils have _____ pore spaces that cause water to drain slowly through the soil. Clay soils are known to have low _____, which results in low _____ rates and poor drainage.	**4**	**CO3**
Q 4	State the different conditions in which direct shear test can be conducted in the laboratory.	**4**	**CO4**
Q 5	Differentiate between primary consolidation and secondary consolidation of soil.	**4**	**CO5**
	SECTION B (Q4x10=40) Answer all questions		
Q 6	Calculate the specific gravity of solids and the degree of saturation, if the density of a partially saturated soil was found to be 1.99 gm/cc, at a moisture content and void ratio of the soil to be 25.8% and 0.79 respectively.	**10**	**CO1**
Q 7	Describe the slope failure mechanisms that lead to them.	**10**	**CO2**
Q 8	The permeability of the sample is estimated to be 10 × 10–4 cm/s. If it is desired that the head in the stand pipe should fall from 26 cm to 13 cm in 3 min., determine the size of the stand pipe which should be used. Take the initial dimension of the sample to be 8 cm dia and 10 cm high.	**10**	**CO3**
Q 9	Determine the void ratio for a pressure $\sigma 3$ of 500 kN/m^2, if the laboratory consolidation data for an undisturbed clay sample are as follows. e1=1.00, $\sigma 1$=85 kN/m^2, e2= 0.90, $\sigma 2$=465 kN/m^2.	**10**	**CO5**
	SECTION-C (Q2x20=40) Answer all questions		
Q 10	a. The maximum dry density of a sample by the light compaction test is 1.8 gm/cc at an optimum water content of 17%. Find the air voids and degree of	**10+10**	**CO3**

	saturation. Specific gravity G=2.67. What would be the corresponding value of dry density on the zero air void line at OMC? b. Explain the effect of compaction on properties of soil.		
Q 11	a. A sample of dry cohesion-less soil was tested in a tri-axial machine. If the angle of shearing resistance was 36º and confining pressure 120 kN/m^2, determine the deviator stress at which the sample failed. [15] b. Draw a neat sketch of Tri-axial cell and label it. [5] (OR) a. Discuss the effect of water table on effective stress. [5] b. Determine the effective stress at various levels AA and BB of the soil sample shown in figure. Assume all missing data like Y_w, Blue arrow line indicates GWT. [15]  	**15+5**	**CO4**