

INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL **B.Sc.** (Applied Sciences) in Engg. End – Semester Theory Examinations – Nov./ Dec. 2020 **III SEMESTER - GEOTECHNICAL ENGINEERING (ICE 233)** (Branch:Civil)

Time: 3 Hours		Date: 25 November 2020	Max. Marks: 50
√ √	Answer ALL the que Missing data, if any,	stions. may be suitably assumed	
1A.	Explain with neat ske	splain with neat sketch a) Single grained soil structure b) Flocculated soil structure	
1 B .	Obtain a relationship specific gravity.	Obtain a relationship between the degree of saturation, voids ratio, water content, and pecific gravity.	
1C.	The saturated specimen of undisturbed clay has a volume of 4.0x10 ⁻⁵ m ³ and its weight is 7.4X10 ⁻⁴ kN. After oven drying the weight reduces to 5.6x10 ⁻⁴ kN. Calculate i) water content ii) specific gravity iii) dry unit weight iv) void ratio.		
2A.	Tests on a clay sample indicated the following properties of the soil		
	a) Natural water content = 30.5%		
	b) Liquid limit = 35.4%		
	c) Plastic limit = 20.5%		
	d) D60 =0.006 mm		
	e) D10 =0.0005mm		
	f) D30 =0.001mm		
	Calculate the a) liqui plasticity Index.	dity index b) uniformity coefficient c) co	nsistency index d)
2B.	Explain the various co	prrections applied for hydrometer readings.	
2C.	Explain the step by s	tep process of soil classification as per IS	S code.
3A.	The depth of water in a well is 5 m. Below the bottom of the well lies a layer of sand 6 m thick overlaying a clay deposit. The following details are available. $G_S = 2.65$, $G_C = 2.7$, $W_{sand} = 24\%$, $W_{clay} = 19\%$. Calculate the effective, neutral, and total pressure at points 3 m below and 3 m above clay surface.		
3B.	Calculate the coeffic c/s area, if a quantity effective constant he	ient of permeability of a soil sample 7cm y of water equal to 500 cc flows down ad of 55 cm. If the void ratio of the so	in height and 60 cm^2 in in 11 minutes under an il is 0.44, calculate the

3C. Briefly explain the quick sand condition.

seepage velocity of water during the test.

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4A. A soil stratum with permeability, $k=4x10^{-7}$ cm/sec overlies an impermeable stratum. The impermeable stratum lies at a depth of 15m below the ground level. A sheet pile wall penetrates 5m into the permeable stratum. Water stands to a height of 8m on the upstream side and 1m on the downstream side above the ground level. Assume Nf = 4 and Nd = 6, determine:

i)Quantity of seepage

ii)Seepage pressure at a point P located 5m below the surface of soil stratum and 3m away from the sheet pile wall on its downstream side. Take no.of potential drops at that point as 5.

iii)Pore pressure at point P

iv)Maximum exit gradient if avg. length of exit field is 2m.

- 4B. During a compaction test, soil attains a maximum dry density of 15 kN/m³ at an optimum moisture content of 13%. Determine the degree of saturation and percentage air voids at maximum dry density. The specific gravity of soil solids is 2.65.
- 4C. What are the advantages and disadvantages of a direct shear test?
- 5A. Specimen of clay of diameter 50 mm and height 70 mm tested in a triaxial test failed at an additional axial load of 0.5 kN at a cell pressure of 100 kN/m². If the change in length of the specimen is 4.5 mm and cohesion is 45 kN/m², calculate the angle of internal friction and the angle of failure plane with the axis of the specimen. At what axial stress a similar specimen fails if tested in an unconfined compression test. Use the analytical method.
- 5B. A soil sample 25mm thick takes 25 minutes to reach 15% consolidation. Find the time 3 required for the clay layer of 5m thick to reach 30% consolidation. Assume double drainage in both cases.
- 5C. Find intensity of vertical pressure at a point 5m directly below a 30kN point load acting at a horizontal ground surface. And what will be the vertical pressure at a point 3m horizontally away from the axis of loading but at the same depth 5m? use Boussinesq's equation.

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