

MANIPAL INSTITUTE OF TECHNOLOGY

V SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: GEOTECHNICAL ENGINEERING [CIE 3101]

REVISED CREDIT SYSTEM (24/11/2015)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitable assumed.

1A.	Explain with the help of neat sketch the silica and gibbsite sheets of clay minerals.									3	CO1
1R	Differentiate between i) air content and percentage air voids <i>ii</i>) water content and degree								3	CO1	
	of saturation iii) consistency index and liquidity index										
1C.	The saturated specimen of undisturbed clay has a volume of 3.2×10^{-5} m ³ and its weight is 6.2×10^{-4} kN. After oven drying the weight reduces to 4.8×10^{-4} kN. Calculate i) water content ii) specific gravity iii) dry unit weight iv) voids ratio.								ht is vater	4	CO1
2A.	 50 grams of oven dried soil with size varying from 0.001 mm to 0.075 mm is taken for the hydrometer analysis in a jar of height 30 cm. The corrected hydrometer reading in 1000 ml soil suspension after 5 minutes is 20 and effective depth is 10 cm. If specific gravity of soil solids is 2.7 and viscosity of soil water suspension is 1x10⁻⁶ kN sec/m² calculate: i) Diameter of the particles corresponding to 5 minutes ii) Percentage finer than this diameter iii) Time taken for all the particles to settle to the bottom of the jar 								for g in cific c/m ²	3	CO1
2B.	Classify the Soil	we soils A and B as % passing 0.075 mm sieve 10 78	s per IS soil clas % passing 4.75 mm sieve 82 92	sification D10 (mm) 0.12 0.001	n system D30 (mm) 0.3 0.003	D60 (mm) 1.2 0.12	WL % 30 48	PL % 18 32		3	CO1
2C.	A soil profile consists of 3m depth of sand above the clay stratum. The specific gravity and voids ratio of sand stratum is 2.7 and 0.65 respectively. The clay stratum has water content of 20% and specific gravity 2.7. Water table is at a depth of 1.2 m from ground level and sand above water table is saturated 40%. Calculate the total and effective stresses at 4.5 m and 1m below ground level. If the soil of depth 0.5 m above water table is saturated due to capillary, what are the changes in total and effective stresses at these depths?							vity vater ound the	4	CO3	
3A.	Obtain the expression for average permeability of the soil when water is flowing perpendicular to the direction of bedding plane.								3	CO2	
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3B.	A 4 m thick soil stratum has specific gravity 2.65 and voids ratio of 0.6. Determine the head at which upward seepage will cause quick sand condition. If coefficient of permeability of the soil is $5x \ 10^{.6}$ m/sec, what is the flow per sq.m area required to maintain critical condition.						3	CO2	
3C.	In figure Fig. Q.3C soil has a permeability of $4x \ 10^{-3}$ cm/s and the loss of head in soil Y is 10 cm. Calculate the permeability of soil Y and rise of water in a tube inserted at point P						4	CO2	
4A.	Following are the results of Water content (%) Bulkunitweight(kN/m ³) i) Plot the compaction curv the 10 % percentage air voi	btained fro 5 17.7 re and obta ids line an	om standard 10 19.8 ain OMC an d 95% degr	1 compacti 14 21 nd maximu ree of satu	on test. 20 21.8 um dry unit ration line.	25 21.6 t weight ii) Take G=2.	Also plot 7	3	CO4
4B.	What is Mohr Coulomb failure theory. Explain the procedure to obtain the strength envelope from shear and triaxial shear tests						3	CO5	
4C.	Specimen of clay of diameter 60 mm and height 80 mm tested in a triaxial test failed at an additional axial load of 0.6 kN at a cell pressure of 100 kN/m^2 . If the change in length of the specimen is 4.62 mm and cohesion is 50 kN/m ² , calculate the angle of internal friction and the angle of failure plane with axis of the specimen. At what axial stress the similar specimen fails if tested in unconfined compression test. Use either graphical or analytical method						t failed at in length of internal stress the aphical or	4	CO5
5A.	Calculate the vertical stress at the center of shaded area shown in figure Fig. Q. 5A at a depth of 2m.						4	CO3	
5B.	List the assumptions and explain the Terzaghi's one dimensional consolidation theory						2	CO4	
5C.	A clay layer whose total settlement under a given loading is expected to be 10 cm settles 4cm at the end of two months after the application of load increment. How many months will be required to reach a settlement of 5 cm. How much settlement will occur in 15 days. Assume the layer to have double drainage						4	CO4	



Fig. Q 3C



Fig. Q 5A