

BACHELOR OF ENGINEERING (CIVIL ENGINEERING) FIFTH YEAR SECOND SEMESTER SUPPLEMENTARY EXAM – 2023
ADVANCED SOIL MECHANICS

TIME: Three Hours

FULL MARKS: 100 (Part I:50+Part II: 50)

Use separate answer script for each Part

PART I (50 Marks)*Answer all the questions**Assume any data if needed, reasonably*

1. (a) Define the term “state of stress” at a point. (2)
- (b) Prove that: ‘if the stress vectors acting on three mutually perpendicular planes passing through a point are known, we can determine the stress vector acting on any other arbitrary plane at that point’. (10)
- (c) Show that out of the nine rectangular stress components only six are independent. (10)
2. (a) Describe maximum shear stress theory. (3)
- (b) How does the projection of the yield surface in deviatoric plane looks like for octahedral shear stress theory? Prove it. (10)
3. (a) Focusing on design guidelines, write a short note on vertical sand drains. (5)
- (b) From Terzaghi’s one dimensional consolidation equation prove that the excess pore water pressure (u) can be expressed as: (10)

$$u = \sum_{n=1}^{n=\infty} \left(\frac{1}{H} \int_0^{2H} u_i \sin \frac{n\pi z}{2H} dz \right) \sin \frac{n\pi z}{2H} \exp \left(\frac{-n^2 \pi^2 T_v}{4} \right)$$

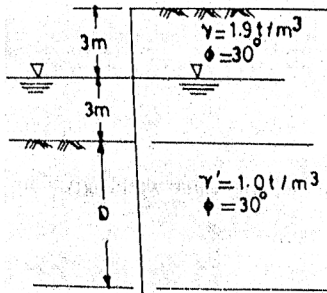
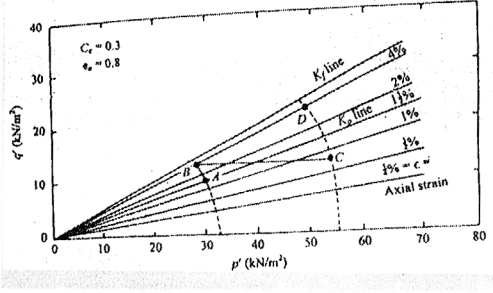
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Part - II (50 Marks)

Answer any TWO from Q.1, 2 & 3. Q.4 is mandatory.

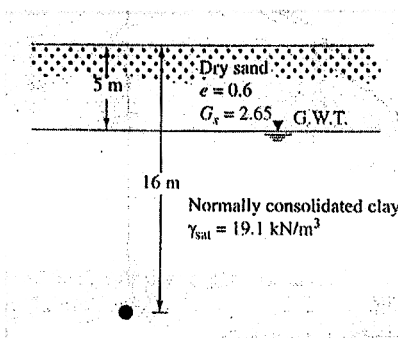
No. of Questions		Marks
Q.1.a)	<p>For the cantilever sheet pile wall, compute the depth of embedment of sheet pile. Draw a neat sketch of the pressure diagram.</p>  <p>The soil below the dredge line is sand with properties as shown.</p>	20
Q.2)		

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No. of Questions		Marks
Q.3.	<p>The p' and q' diagram for a normally consolidated clay is shown in the above figure. The specimen was obtained from an average depth of a clay layer of total thickness of 2m. $C_c = 0.3$ and $e_0 = 0.8$.</p> <p>Calculate the total settlement (elastic and consolidation) for a loading following stress path ABC.</p> <p>Calculate the total settlement for a loading following stress path ABD.</p>  <p>A specimen of clay was collected from the field from a depth of 16 m (as shown above). A consolidated undrained triaxial test yielded the following results: $\phi = 30^\circ$, $A_r = 0.8$. Estimate the undrained shear strength q_u of the clay.</p>	<p>10</p> <p>10</p> <p>20</p>
Q.4.	<p>Write short notes on (any FOUR):</p> <ul style="list-style-type: none"> i) Stress path ii) Fixed earth support method of anchored bulk head iii) Cantilever sheet pile iv) Skempton's pore pressure parameters v) UU test 	10