

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2017
(3RD YEAR 2ND SEMESTER)

(1st./2nd Semester/~~Repeat~~/Supplementary/Spl. Supplementary/~~Old~~/~~Annual~~/~~Biannual~~)

SUBJECT: SOIL MECHANICS II

(Name in full)

Full Marks 30/100

Time: ~~Two hours~~/Three hours/~~Four hours~~/Six hours

No. of Questions		Marks																												
<u>Answer all questions (IS codes not allowed)</u>																														
Q1	<p>The results of two UU triaxial tests on a typical silty clay soil are as follows: Specimen 1 : $\sigma_3 = 100\text{kPa}$; $(\sigma_1 - \sigma_3) = 247\text{kPa}$ Specimen 2 : $\sigma_3 = 150\text{kPa}$; $(\sigma_1 - \sigma_3) = 335\text{kPa}$</p> <ol style="list-style-type: none"> Determine the shear strength parameters. Determine the shear stress on the failure plane and indicate theoretical angle of the failure plane Determine the maximum shear stress at failure and inclination of the plane on which it acts. What is the available shear strength on this plane? 	8 6 6																												
Q2	<p>A 6m retaining wall with a vertical back face retains a homogeneous saturated soft clay. Unit weight of the clay is 18.4 kN/m^2 and undrained shear strength, c_u, of the clay is 35 kPa.</p> <ol style="list-style-type: none"> Draw the variation of Rankine's active pressure on the wall with depth. Find the depth up to which a tensile crack can occur. Determine the total active force per unit length of the wall before and after tensile crack occurs. Also find the location of resultant. What will be the magnitude of active force per unit length if effective shear strength parameters are mobilized. Take $c' = 0$, $\phi' = 27^\circ$. 	5 3 7 5																												
Q3	<p>A shallow foundation of size $3\text{m} \times 3\text{m}$ is to be constructed at a depth of 1.5m below existing ground level. Properties of subsoil down to 10m below G.L. are as follows: Bulk density, $\gamma = 18.4\text{kN/m}^3$; Angle of shearing resistance, $\phi = 30^\circ$; Cohesion, $c = 0.0$. Bearing capacity factors :</p> <table border="1" data-bbox="373 1366 730 1635"> <thead> <tr> <th>Φ</th> <th>N_c</th> <th>N_q</th> <th>N_γ</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>9.61</td> <td>2.69</td> <td>0.56</td> </tr> <tr> <td>15</td> <td>12.86</td> <td>4.45</td> <td>1.52</td> </tr> <tr> <td>20</td> <td>17.69</td> <td>7.44</td> <td>3.64</td> </tr> <tr> <td>25</td> <td>25.13</td> <td>12.72</td> <td>8.34</td> </tr> <tr> <td>30</td> <td>37.16</td> <td>22.46</td> <td>19.13</td> </tr> <tr> <td>35</td> <td>57.75</td> <td>41.44</td> <td>45.41</td> </tr> </tbody> </table> <p>Assume ground water table at a depth of 2.0m below G.L. Determine the ultimate and allowable bearing capacity of the foundation using generalized bearing capacity equation. What will be the increase / decrease in factor of safety if water table rises to the G.L. and if it goes down to 5.0m below G.L.? Give detail calculation indicating how the effect of local shear and variation of water table is considered in the analysis.</p>	Φ	N_c	N_q	N_γ	10	9.61	2.69	0.56	15	12.86	4.45	1.52	20	17.69	7.44	3.64	25	25.13	12.72	8.34	30	37.16	22.46	19.13	35	57.75	41.44	45.41	13+7
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Ref No.-Ex/CE/T/326/2017

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No. of Questions		Marks
Q4	<p>A 5m high embankment is to be constructed over a deep soft clay deposit. Properties of embankment and foundation soil are as follows: Embankment soil : $c = 30\text{kpa}$, $\phi = 15^\circ$, $\gamma = 19.5\text{kN/m}^3$ Foundation soil : $c = 35\text{kpa}$, $\phi = 0^\circ$, $\gamma = 17.5\text{kN/m}^3$ Inclination of the slope : 1.5H:1V. Surcharge over the embankment is 20kPa. Determine the factor of safety of the slope for a typical slip circle passing through the toe of the embankment using method of slices. Give detail calculation. Discuss whether there will be any change in factor of safety if tension cracks are developed on the top of the embankment</p>	17+3
Q5	<p>Write short note on :</p> <ol style="list-style-type: none">Modified proctor compaction testStandard penetration test and the related correctionsVane shear testLocal and punching shear failure	5 x 4