

## BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2019

(3RD YEAR 2ND SEMESTER)

(1<sup>st</sup>/ 2<sup>nd</sup> 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	Part I (60 MARKS)	Marks
<i>Answer all questions</i>		
Q1(a)	Write the expression for vertical stresses below the centerline of circular loaded area and using this expression draw Newmark's chart.	8+12=20
(b)	Using this Newmark's chart determine the stresses and also draw the stress distribution diagram on horizontal planes at depth 5m and 10m below two closely spaced raft of size 15m x 20m and 20m x 25m with clear spacing of 5m resting at a depth of 2m below G.L. Average pressure over both the foundations is 80 kPa.	
Q2	<p>A 8m high retaining wall, with a vertical back face and resting over very dense sand (unit weight 20kN/m<sup>3</sup> and <math>\phi = 35^\circ</math>), retains homogeneous compacted clay (Unit weight 19.0 kN/m<sup>3</sup> and undrained shear strength parameters, <math>c = 35</math> kPa and <math>\phi = 15^\circ</math>) of thickness 5.0m followed by medium sand of unit weight 19 kN/m<sup>3</sup> and <math>\phi = 33^\circ</math>. Take ground water table at the ground level.</p> <ol style="list-style-type: none"> <li>Draw the variation of Rankine's active pressure on the wall with depth.</li> <li>Determine the total active force per unit length of the wall. Also find the location of active force.</li> <li>What will be the increase or decrease in active force per unit length if the top clayey soil gets saturated due to rain and the corresponding shear strength parameters mobilized become <math>c = 15</math> kPa, <math>\phi = 0^\circ</math>. Neglect increase in unit weight due to saturation. Assume ground water table rises 2m above ground level. Take no change in properties of the sand layer due to saturation.</li> </ol>	5+7+8=20
Q3	<p>A 8m high embankment is to be constructed over a hard clay deposit. Properties of embankment are as follows:  Embankment soil : <math>c = 40</math> kPa, <math>\phi = 12^\circ</math>, <math>\gamma = 20</math> kN/m<sup>3</sup>  Inclination of the slope : 1.5H:1V.  Surcharge over the embankment is 40kPa.  Ground water table is at the ground level.  Determine the factor of safety of the slope for a typical slip circle touching the foundation soil using method of slices. Assume a tension crack has been developed at a distance of 3m from the edge of the embankment. Give detail calculation.</p>	20

**B.E. CIVIL ENGINEERING THIRD YEAR  
SECOND SEMESTER EXAM 2019**

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

**SUBJECT: SOIL MECHANICS-II**

(Name in full)

**PAPER xxxx**

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

**Full Marks 30/100**

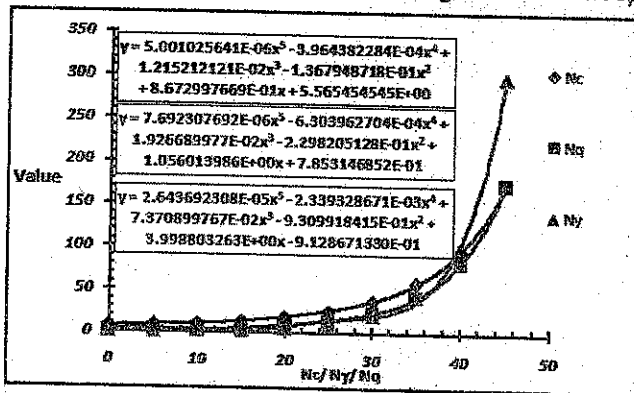
(45/40 marks for this part)

Use a separate Answer-Script for each part

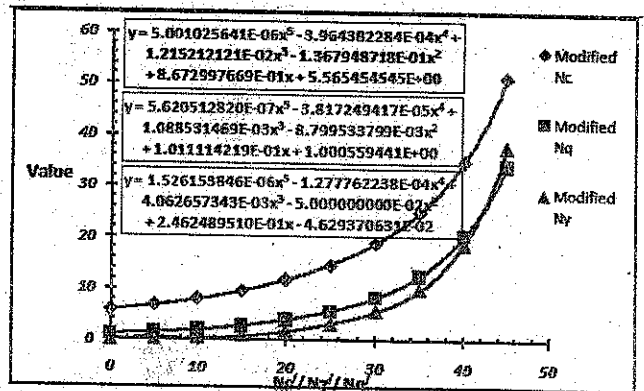
No. of Question	<ul style="list-style-type: none"> <li>Maintain neatness and assume reasonable data if it is not supplied.</li> <li>Answer all questions, All sketches-must be drawn by pencil</li> </ul>	Marks
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**Part-II**

- (1) (a) Compare between Net safe bearing capacity and Allowable bearing capacity. 4  
 Or  
 Compare between Net loading intensity and Ultimate bearing capacity.
- (b) Compare the expected trend of load verses settlement relationship of the footing for the following three cases: 6  
 a) General Shear Failure, b) Local Shear Failure and c) Punching Shear Failure.  
 Or  
 Write notes on: a) General Shear Failure, b) Local Shear Failure and c) Punching Shear Failure.
- (c) What is the effect of eccentricity on bearing capacity? Clarify with sketch. 5
- (d) What will be the gross and net allowable bearing pressure of sand having  $\phi = 36^\circ$  and effective unit weight of  $18 \text{ kN/m}^3$  under the following cases (a) 1m wide strip footing, (b) 1 m x 1m square footing, (c) circular footing of 1m diameter. 5  
 During calculation, consider following conditions of water table: (i) water table at the foundation base level, (ii) water table at the ground level.  
 The saturated unit weight of soil is  $21.3 \text{ kN/m}^3$ .
- (2) (a) What is meant by 'soil exploration'? What are the objectives of sub-soil exploration? 3 + 3  
 Or  
 What should be the responsibilities of designer to ensure the proper execution of sub soil exploration? 6
- (b) Discuss about the information required from sub-soil exploration. 7
- (c) What information should a good soil test report contain? 7



Supporting Figure 1: Terzaghi's bearing capacity factors (Nc, Nq and Ny)



Supporting Figure 2: Terzaghi's bearing capacity factors (Nc', Nq' and Ny')

**End**