Ref. No.: EX/CE/5/T/307/2018 (Old)

B.E. CIVIL ENGINEERING (PART TIME) THIRD YEAR SECOND SEMESTER EXAM 2018 (Old)

SOIL MECHANICS – II

Time: 3 Hours **Full Marks: 100**

(50 marks for each part)

Part I

Use Separate Answer scripts for each Part

Answer ALL Questions

Assume any Reasonable Value of Any Parameter if required

NO IS CODE OR OTHER REFERENCE MATERIAL IS ALLOWED IN THE EXAM HALL

1. Write short notes on the following – 4 × 5
   a. Assumptions of Terzaghi's bearing capacity theory
   b. Newmark's Chart
   c. Different types of Shear failure
   d. Effect of Groundwater table on Bearing Capacity

2. a) Using a suitable Newmark's Chart find the stress increment at a depth of 4m below the centroid of an equilateral triangular footing of 8m sides carrying a uniformly distributed load of 100 kN/m^2. 10

   b) Find out the depth vertically below the point of application of a point load of 100 kN where the stress increment following Boussinesq's analysis and Westergaard's analysis will give same result. 5

3. Determine the change in ultimate bearing capacity of a 2m × 3m rectangular footing founded at a depth of 2m below ground level in a non-cohesive deposit having $\phi = 24°$ and $\gamma_{sat} = 1.95$ gm/cc when the ground water table drops from a maximum position of 0.5m below GL to 3m below GL. Follow IS: 6403-1981 guidelines 15

Factors following IS:6403-1981 (All symbols carry usual meaning)

$\phi°$	0	5	10	15	20	25
N_c	5.14	6.49	8.35	10.98	14.83	20.72
N_q	1.00	1.57	2.47	3.94	6.40	10.66
N_γ	0.00	0.45	1.22	2.65	5.39	10.88

$s_c = s_q = 1 + 0.2\,{}^{B}/_{L}\,;\; s_\gamma = 1 - 0.4\,{}^{B}/_{L}$

$d_c = 1 + 0.2\,{}^{D_f}/_{B}\sqrt{N_\emptyset}\,;\; d_q = d_\gamma = 1\; for\; \emptyset < 10° \;\&\; d_q = d_\gamma = 1 + 0.1\,{}^{D_f}/_{B}\; for\; \emptyset > 10°$

$i_c = i_q = \left(1 - {}^{\alpha}/_{90}\right)^2\,;\; 1_\gamma = \left(1 - {}^{\alpha}/_{\emptyset}\right)^2$

Form A: Paper-setting Blank

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B.E. CIVIL ENGINEERING (PART TIME) THIRD YEAR SECOND SEMESTER EXAM 2018 (Old) (~~1st~~/2nd Semester/~~Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual~~)

SUBJECT: **SOIL MECHANICS-II**

(Name in full)

PAPER ××××

Time: ~~Two hours~~/ Three hours/~~Four hours/Six hours~~ **Full Marks ~~30~~/100**

(~~15~~/50 marks for each part)

Use a separate Answer-Script for each part

No. of Question

1. *Answer any two questions.*
2. All drawings-must be drawn by pencil.
3. *Maintain neatness.*
4. *Assume reasonable values of data if it is not supplied.*
5. No code etc. will be needed to answer the questions of this part.
6. *Do not retain mobile phone in any form to avoid RA.*

Mark

Part -II

(1)(A) What are the major assumptions of Coulomb's earth pressure theory? 3

(B) Just show the relation (without any derivation) between active earth pressure coefficient and passive earth pressure coefficient in terms of N_{ϕ}. 2

(C) What is known as critical depth for active earth pressure for cohesive soil? Explain 3

(D) Answer any one from a) and b) 4

a) Derive general expression for passive earth pressure for cohesive soil.

b) Derive general expression for active earth pressure for cohesive soil.

(E) A 4.5 m sand backfill is to be retained by a retaining wall which has a vertical backface. A uniform surcharge of 5t/m^2 is placed over the backfill. The water table is at 2 m depth below the G.L. The specific gravity of solids and void ratio of the backfill are 2.65 and 0.75 respectively. The soil above the water table has a degree of saturation of 10%. The angle of internal friction of the soil, both above and below water table, is $\emptyset=31^{\circ}$. Find out the value and point of application of the active thrust with respect to the ground level. 8

Or

A R.C.C. retaining wall, having a back-face inclined to the vertical at 10°, has to retain horizontal backfill of dry sand up to a height of 5.0 m. The soil has a unit weight of 17.4 kN/m^3 and an angle of internal friction of 29°. The angle of friction between soil and concrete may be taken as 18°. Determine the point of application, direction and magnitude of active thrust by any suitable *graphical method*. 8

(F) Answer any one from i) and ii) 5

i) Derive general expression for passive earth pressure for cohesionless soil.

ii) Derive general expression for active earth pressure for cohesionless soil.

(2)(A) (a) What is meant by 'soil exploration'? 3+3

(b) What are the objectives of sub-soil exploration? = 6

(B) Discuss in general manner about the four phased sequence of execution of a sub soil exploration program. 14

(C) (c) Give a general guiding table in relation with depth of exploration at the start of work, having the following columns in it: 5

Type of foundation	Depth of Exploration.

(3)(A) Derive the relation $S_n = [c/(\gamma H_c)]$ for c-ϕ soil, 5

Where all the notations have been used for their conventional meanings.

(B) A cutting is to be made in a soil mass having a unit weight of 18.5 kN/m^3, cohesion of 16 kN/m^2 and an angle of internal friction of 14°, with side slopes of 32° to the horizontal up to a depth of 5

Form A: Paper-setting Blank

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SUBJECT: **SOIL MECHANICS-II**

(Name in full)

PAPER ××××

Time: ~~Two hours~~/ Three hours/~~Four hours/Six hours~~ **Full Marks ~~30~~/100**

(~~15~~/50 marks for each part)

Use a separate Answer-Script for each part

12 m below ground level. Determine the factor of safety of the slope against shear failure. Assume that friction and cohesion are mobilized to same proportion of their ultimate values.

(3)(C) A slope of 35° inclination and 5.5 m vertical height is to be made in a purely cohesive soil having a unit weight of 18.5 kN/m³ and cohesion of 60 kN/m². Show the way to determine the factor of safety of the slope against sliding failure by any conventional method (one typical attempt only in case of *graphical method*). 15

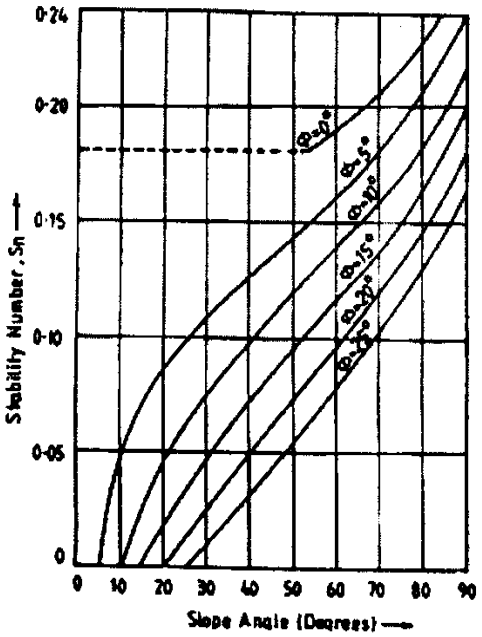

Fig. 1

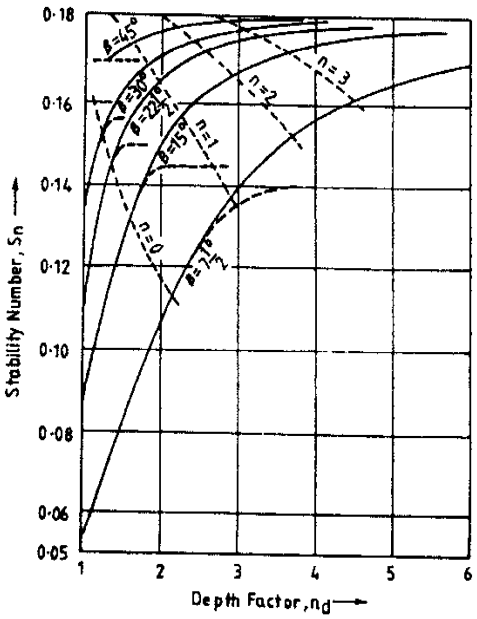

Fig. 2

Table. 1

Slope (V:H)	Slope Angle (β)	Values of angles	
		α_1	α_2
1:0.58	60°	29°	40°
1:1	45°	28°	37°
1:1.5	33°48′	26°	35°
1:2	26°36′	25°	35°
1:3	18°24′	25°	35°
1:5	11°18′	25°	27°

End of the questions