

**B.E. CIVIL ENGINEERING THIRD YEAR  
FIRST SEMESTER SUPPLEMENTARY EXAM 2018**

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

**SUBJECT: SOIL MECHANICS - I**

(Name in full)

PAPER ~~xxxx~~

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

Full Marks 30/100  
(45/50 marks for each part)

Use a separate Answer Script for each part

Page : 1 of 2

1. Answer any five questions.
2. Maintain neatness. Assume reasonable value of data if it is not supplied.
3. All drawings-must be drawn by pencil. Do not retain mobile phone during examination.
4. No code etc. will be needed to answer the questions of this part

No. of Question		Marks
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(1)(a) What is meant by Atterberg Limits? How the state changes from liquid state to solid state with the decrease in moisture content show with a representative figure. 2+2=4

(b) Compare qualitatively the shear strength, compressibility and permeability of the following soils with justification: 10

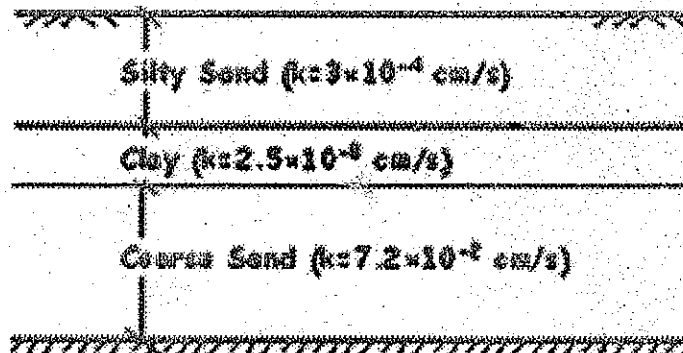
	Soil A	Soil B
LL (%)	62	48
PL (%)	21	17
Natural moisture content(%)	42	35

(c) The Atterberg limits of a given soil are, LL= 50%, PL= 38% and SL= 22%. The specific gravity of soil solids is 2.60. The sample of the soil at LL has a volume of 20 cc. What will be the final volume of the soil if the sample is brought to its Shrinkage limit? 6

(2)(a) Deduce the relationship  $\Delta q = k_v \cdot H \cdot (N_f/N_d)$ , the notations have their usual meanings. 8

(b) Derive the expression of equivalent permeability parallel to bedding planes. 5

(c) Following figure shows a soil profile at a given site. Determine: (a) average coefficient of permeability of the deposit, (b) equivalent coefficient of permeability of the deposit in the horizontal and vertical directions. 2+5=7



(3)(a) What is meant by 'shear strength of soil'? Establish the relationship between principal stresses and shear strength parameters of soil. 8

(b) An un-drained tri-axial test was conducted on a silty clay sample and the following results were obtained: 12

Cell Pressure (kN/ m <sup>2</sup> )	50	100	150
Deviator Stress at failure (kN/ m <sup>2</sup> )	350	440	530

Find out the shear strength parameters of the soil.

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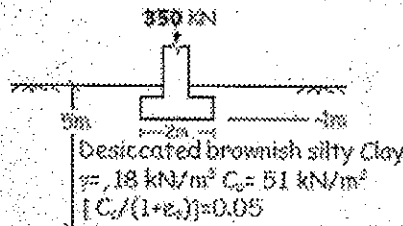
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Page : 2 OF 2

- (4)(a) In order to determine the field permeability of a free aquifer, pumping out test was performed and following observations were made: 10  
 Diameter of well: 20 cm, Discharge of the well = 270m<sup>3</sup>/hour, R.L. of original water surface, before pumping started = 240.5 m, R.L. of well at constant pumping = 235.6 m, R.L. of impervious layer = 205 m, R.L. of water in observation well = 239.8m, Radial distance of observation well from tube well = 50m. Calculate the coefficient of permeability.
- (b) Deduce Laplace equation in respect of seepage of water of soil. 10
- (5)(a) State the parameters determined from laboratory consolidation test. 2
- (b) "The "dry unit weight vs. moisture content" curve initially rises, then falls after attaining a highest value" - explain the reason behind such nature of the curve in perspective of "three phase system" of soil. 4
- (c) Following figure shows an isolated column in a building frame with a column grid of 4m x 4m 8  
 which carries a vertical load of 350 kN and is supported on a footing 2m x 2m, placed 1m below GL. The subsoil consists of 5m of firm desiccated silty clay followed by sand (N=18). Calculate the consolidation settlement of the footing. Use 2V:1H dispersion of vertical stresses.



- (d) Draw two typical compaction curves for both standard and modified proctor tests and bring out the differences between these two with proper justification. 3+3=6
- (6)(a) Give the concerned typical names of the Group symbols (for Unified Soil Classification system): 4x1=4

Group Symbols:	Typical names:	Group Symbols:	Typical names:
GP		OL	
ML		SW	

- (b) What are utilities of soil classification systems? Draw Casagrande's Plasticity chart by Pencil. 3+5=8
- (c) Classify the following soils on the basis of data provided using plasticity chart. 8

Soil	Liquid limit	Plastic limit	% passing through 75 micron sieve	% gravel > 4.75 mm	% sand (4.75 mm) - (0.075 mm)
A	390	52	100	0	0
B	38	22	80	0	20
C	60	30	82	0	18
D	36	21	22	59	19