BACHELOR OF ENGINEERING (CIVIL ENGINEERING) THIRD YEAR
FIRST SEMESTER EXAM 2019 (Old)
(1st /2nd-Semester/Repeat/Supplementary /Spl. Supplementary /Old/Annual/Bi-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. _Assume reasonable value of data if it is not supplied._

No. of Question		Marks

(1)(a) What are meant by Atterberg limits?   3

(b) The Atterberg limits of a given soil are, LL= 55%, PL= 41% and SL= 22%. The specific   4
gravity of soil solids is 2.65. The sample of the soil at LL has a volume of 22 cc. What will
be the final volume of the soil if the sample is brought to its Shrinkage limit?

(c) Explain all the corrections required during the hydrometer test.   5

(d) Compare qualitatively the shear strength, compressibility and permeability of the following   8
soils with justification:

	Soil A	Soil B
LL (%)	65	47
PL (%)	22	16
Natural moisture content(%)	43	35

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

(b) The water table in a certain deposit of soil is at a depth of 5 m below GL. The soil consists   12
of clay down to 6 m below GL. This is followed by a deep sand stratum. The soil above the
water table is saturated. Given that for clay w= 36%, G = 2.70 and for sand = 27%, G=
2.65. Find the distribution of total, effective stress and pore-water pressure down to 15 m
below GL. What will be the change in effective stress, if the water table is brought down by
1.50 m.

(3)(a) Define 'shear strength of soil' and establish the relationship between principal stresses and   8
shear strength parameters of soil.

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

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

Find out the shear strength parameters of the soil.

(4)(a) Deduce Laplace equation in respect of seepage of water of soil.   10

(b) In order to determine the field permeability of a free aquifer, pumping out test was   10
performed and following observations were made:
Diameter of well: 20 cm, Discharge of the well= 240m^3/hour, R.L. of original water surface,
before pumping started= 240.5 m, R.L. of well at constant pumping = 240.5 m, R.L. of
impervious layer= 210m, R.L. of water in observation well= 239.8m, Radial distance of
observation well from tube well= 50m. Calculate the coefficient of permeability.

(5)(a) Compare between compaction and consolidation in respect of differences and similarities.   2×3=6

(b) State which parameters may be determined from laboratory consolidation test?   2

(c) What is meant by "zero air void line"?   2

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(5)(d) Draw two typical compaction curves for both standard and modified proctor tests and bring   3+3=6
out the differences between these two with proper justification.

(e) Comment on the applicability of (1) sieve analysis and (2) hydrometer analysis   4

(6)(a) What are utilities of soil classification systems? Draw Casagrande's Plasticity chart and   3 +5
Classify soil A and soil B of question no.1 accordingly.

(b) A stratified soil deposit consists of four layers, each of equal thickness. The coefficient of   7
permeability of second, third and fourth layers are respectively one third, half and twice of
that of the top layer. Compute the ratio of the average permeabilities of the deposit
(parallel: perpendicular, with respect to the direction of stratification).

(c) Deduce the formula for finding per cent finer corresponding to a particular hydrometer   5
reading.