Ref No.– Ex/CE/T/315/2019

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2019
(3rd YEAR 1st SEMESTER)
(1st / ~~2nd~~ Semester/~~ Repeat/ Supplementary/Spl. Supplementary/Old/ Annual/ Biannual~~)
SUBJECT: SOIL MECHANICS I
(Name in full)

Full Marks ~~30~~/100

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

No. of Questions		Marks
	Answer all questions	
Q1	(a) For a given soil, G = 2.7, Bulk density = 17.5 kN/m^3 and moisture content = 15%. Determine i) Dry density ii) Void ratio iii) Porosity iv) Degree of saturation v) If degree of saturation is less than 100%, determine additional quantity of water to be added per cubic metre of soil to make it fully saturated.	10
	(b) A soil has liquid limit = 68%, plastic limit = 27%, clay content = 35% and natural moisture content = 45%. Compute its plasticity index, liquidity index and activity. Classify the soil according to plasticity chart. Comment on its consistency, strength, compressibility, permeability and shrinkage / swelling characteristics.	10
Q2	(a) What is quick sand condition? Discuss with neat sketches when it is developed in a soil deposit / mass.	7+8+2= 17
	(b) Subsoil deposit at a particular location consists of a top 4 m thick sand (w=22%, G=2.67) followed by a layer of medium silty clay / clayey silt (w = 28%, G=2.66) down to a depth of 15m below existing ground level. Ground water table is at a depth of 4m below G.L. Draw the total stress, pore water pressure and effective stress distribution down to a depth of 15m for the soil deposit. What will be the increase in effective stress if ground water table rises to ground level?	
Q3	(a)A stratified deposit consists of three horizontal layers of thickness 5m, 4m and 6m respectively. The coefficient of permeability of these layers are 6 x 10^{-5}, 2 x 10^{-6} and 7 x 10^{-5} cm/sec respectively. Find the average coefficient of the deposit in vertical and horizontal direction.	6+10 = 16
	(b) Draw the flownet for seepage analysis through the foundation soil of a typical gravity dam of height 40m and base width 30m. Thickness of foundation soil is 8m and coefficient of permeability is 4 x 10^{-3} cm/sec. Determine the seepage through the foundation soil.	
Q4	What are the factors affecting compaction of a clayey soil? Discuss how the result of a proctor compaction test is used in actual field application emphasizing the methodology adopted if the required degree of compaction is not achieved.	3+4=7

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No. of Questions		Marks
Q5	(a)What is overconsolidation ratio ? Explain with the help of a neat sketch how it is determined from e – log p curve. (b) For a normally consolidated clay, the following data are given: $p_0 = 50\ \text{kN/m}^2$ $e = e_0 = 0.92$ $\Delta p + p_0 = 120\ \text{kN/m}^2$ $e = 0.78$ The hydraulic conductivity(k) of the clay for the preceding loading range is 3.1×10^{-5} cm/ sec. (i) How long (in days) will it take for a 4 m clay layer (drained on both faces) in the field to reach 50% degree of consolidation? (ii) What is the magnitude of settlement at that time.	10+10 =20
Q6	(a) Draw the failure envelope for normally consolidated and over consolidated clay as obtained from UU and CD triaxial tests. (b) The results of two UU triaxial tests on a typical silty clay soil are as follows: Specimen 1 : σ_3 = 100kPa; $(\sigma_1 - \sigma_3)$ = 250kPa Specimen 2 : σ_3 = 150kPa; $(\sigma_1 - \sigma_3)$ = 340kPa i) Determine the shear strength parameters. ii) Determine the shear stress on the failure plane and indicate theoretical angle of the failure plane iii) 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?	6+14 =20