Ref. No. Ex. EX/CON/T/221/2017

B. E. CONSTRUCTION ENGINEERING. 2ND YR 2ND. SEM. EXAM.-2017

SUBJECT SOIL MECHANICS I

Time : Three Hours **Full Marks : 100**

Part - I

Use Separate Answer scripts for each Part

No of Questions		Marks
	Answer any two questions.	
Q1.a.	Calculate the co-efficient of permeability of a soil sample 12cm high and 10cm in diameter subjected to constant head permeability test. The quantity of water equal to 500cc passed down in 10 minutes under an effective constant head of 40cm. On oven during, the test specimen weighs 1291gm. Calculate the seepage velocity of water during the test. Assume specific gravity of the soil solid = 2.67.	10
Q1.b.	The time to reach 60% consolidation is 40 seconds for a sample of 20mm thick tested in laboratory under condition of double drainage. How many years will the corresponding layer in a project site require to reach the same degree of consolidation if it is 10.0m thick and drained on one side only.	06
Q1.c.	Write short notes on i) Boiling of sand. ii) Dilatancy test	06
Q1.d.	A stratum consisting of fine sand is 2.0m thick. Under what head of water, flowing in an upward direction, will a quick condition develop? Assume G = 2.68, e = 0.6	03
Q2.a	The consolidation test data of a soil sample collected from a depth of 5.0m below ground level is given below :	15

Pressure (kg/cm^2)	0	0.25	0.50	1.0	2.0	4.0	8.0	2.0	0.5
Dial gauge reading	2250	2230	2185	2075	1875	1550	1210	1259	1310

One small division of dial gauge = 0.002mm. Diameter and height of consolidation ring are 60mm and 20mm respectively. Specific gravity of the soil solid = 2.68. Dry weight of the soil sample = 82.0 gm. Calculate the void ratio and co-efficient of volume compressibility m_v corresponding to each pressure and pressure range respectively.

Q2.b. Visual identification and laboratory test results on a soil sample are given below. 10

SIEVE ANALYSIS

Sieve Size : (mm)	10.0	4.75	2.00	1.18	0.600	0.300	0.150	0.075
Weight : retained (gm)	NIL	5.0	7.0	12.0	22.0	28.0	48.0	52.0

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SUBJECT SOIL MECHANICS I

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Part - I

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No of Questions		Ma
	Total weight of soil sample = 200gm, colour = yellowish brown, plasticity index = zero Calculate the percent finer corresponding to each sieve size, plot the grain size distribution curve. Calculate the percentage of gravel, coarse, medium and fine sand. Write down the IS classification symbol and description of the soil sample.	
Q3.a.	The sub-soil profile at a site is given below.	1

Depth (m)		Description	Bulk Density (t/m^3)
From	To		
0.00	2.00	Soft grey silty clay	1.780
2.00	4.00	Soft grey silty clay	1.800
4.00	9.00	Firm grey silty clay	1.840
9.00	15.00	Stiff grey silty clay	1.880

	The water table is at 2.0m depth below ground level. Draw the variation of total, neutral and effective pressure with depth.	
Q3.b.	Liquid limit test was carried out on a sample of clay. The test data is mentioned below :	1

Test no.	1	2	3	4
Number of blows :	16	22	34	47
Weight of wet soil and container (g)	48.25	51.00	52.39	55.56
Weight of dry soil and container (g)	40.00	42.00	44.00	46.00
Weight of container (g)	23.50	22.80	24.50	22.1

	Calculate the liquid limit of the soil sample.	
Q3.c.	Write short notes on i) Toughness Index. ii) Liquidity Index	(

SOIL MECHANICS-I PART-II **Ref. No.: Ex/CON/T/221/2017**

Answer any two questions.

Assume relevant data if required

Q1. The data obtained from Standard Proctor test conducted as per IS specifications are presented below. Find out the optimum moisture content and maximum dry density by drawing the moisture density curve. Plot 80% and 100% saturation lines. If it is proposed to ensure a relative compaction of 95% in the field, find out the acceptable range of moisture content for field compaction. Would 20% air void line be the same as 80% saturation curves. Consider sp gravity of soil as 2.7.

Water content(%)	8.5	12.5	1.75	15.5	18.2	20.2	
Wt of wet sample (kg)	1.8	1.94	2.0	2.05	2.03	1.98	(9+7+5+4= 25)

Q-2.(a) Describe Boussinesq and westergaards equation of vertical stress distribution with their points of difference. (6)

(b) Compare the variations of K_b and K_w graphically and put your comments on such variations. (7)

© Draw stress isobar for a point load corresponding to 20% of the surface load. (7)

(d) Derive an expression of dry density in terms of saturated density and specific gravity. (5)

Q3. Establish relationship between major principal stress and shear strength parameters for a purely cohesive soil. (7)

(b) CU tri-axial test results on saturated clay are presented below. Determine the shear strength parameter considering (i) total stress (ii) effective stress approach. (6+6)

Cell pressure (kN/m^2)	Deviator stress at failure (kN/m^2)	Pore water pressure at failure (kN/m^2)
148	100	78
298	198	162
450	304	264
598	403	323

© Write notes on vane shear test. (6)