Ref No.– Ex/CE/T/425A/2017 (Old)

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING EXAMINATION, 2017

(4^{TH} YEAR 2^{ND} SEMESTER)

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

SUBJECT: ADVANCED SOIL MECHANICS (ELECTIVE)

(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 consolidated drained test was conducted on a sand specimen. The initial cell pressure and back pressure were 200 and 100 kPa. Applied deviator stress at failure is 200kPa. a. Plot Mohr circles for both initial and failure stress conditions. b. Determine angle of shearing resistance (assume c = 0) c. Determine the shear stresses at failure and the corresponding failure plane d. Determine maximum shear stress at failure and the angle of the plane on which it acts. Also determine the available shear strength on this plane.	6 + 3 + 5 + 6 = 20
Q2	A 14 m thick clay layer, drained at top only, has to be consolidated using sand drain installed at a spacing of 2.5m c/c in triangular arrangement. A uniform surcharge of 8 t/m^2 is applied at the top of the clay layer. Calculate the average degree of consolidation for combined vertical and radial drainage after 100 and 150 days of load application. Also calculate time required to achieve 95% degree of consolidation. Data given : Cvr = 2Cv = 4 mm^2/min ; r_w = 0.2m ; mv = 0.006 m^2/ton Further, determine the total consolidation of the clay layer. Use the following expression for $U_r = 1 - \exp[-8T_r / F(n)]$ Where, $F(n) = (n^2/(n^2-1))\ln(n) - ((3n^2-1)/4n^2)$	25
Q3	(a) Draw the flownet and calculate the seepage through an earthen dam resting over a hard rock layer with the following data: Height 30m Side slopes 1V:2.5H Freeboard 2m $K_v = K_h = 0.8 \times 10^{-6}$ mm/s Length of filter at the D/S toe = 10m Assume reasonable values of data not supplied.	15
	(b) Using the magnitude of pore pressure in the down-stream face as obtained from flownet diagram (as in Q3a), calculate the factor of safety for a typical slip circle passing through the toe of the dam using Bishop's simplified method. Data given : Bulk density = 19.5 kN/m^3, c' = 25 kPa, $\varphi' = 18^0$.	25
Q4	What is stress path? Draw the stress path diagrams for one dimensional consolidation test, UU and CU triaxial tests.	3+3x4 =15