Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1722005 Date: 20-06-2014

Subject Name: Advanced Foundation Engineering

Time: 02:30 pm - 05:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain various types of Bearing capacity failures with neat sketch. **07**

(b) A Strip footing 3m wide carries a load intensity of 450kN/m^2 at a depth of 1.5m in sand. The saturated unit weight of sand is 20kN/m^3 and unit weight above water table is 17kN/m^3. The Shear strength parameters are c = 0 and Ø=36°. Determine the factor of safety with respect to general shear failure for the water table is just at the base of footing. Use IS code method. Take N_c=50.59,N_q=37.75 and $N_ɔ$=56.31. **07**

Q.2 **(a)** Determine the net bearing pressure for a 2m X 2m footing at a depth o 1.5m in a medium sand so that the total settlement does not exceed 25mm. The average SPT blows below the footing are 22 per 30cm. The average moist unit weight of soil is 18kN/m^3. The water table is at 5m below the ground level. What will be the bearing pressure if the water table rises up to the base of the footing? Use Terzaghiôs formula for bearing pressure and peckôs formula for overburden pressure correction. **07**

(b) Design a rectangular combined footing for two columns shown in Fig.1. The size of column A is 0.3m X 0.3m and column B is 0.4m X 0.4m.Take allowable soil pressure as 100 kN/m^2.

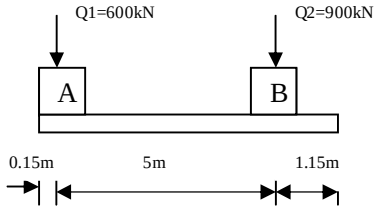

Fig.1

OR

(b) Explain design procedure for trapezoidal combined footing. **07**

Q.3 **(a)** Explain Conventional design of raft foundation. **07**

(b) Design of friction pile group to carry a load of 3000 kN including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20 m, underlain by rock. Average unconfined compressive strength of the clay is 70 kN/m^2. The clay may be assumed to be of normal sensitivity and normally loaded, with liquid limit 60%. A factor of safety of 3 is required against shear failure. **07**

OR

Q.3 **(a)** What is Negative skin friction? How you can calculate the magnitude of negative friction for cohesive and granular soil? **07**

(b) A concrete pile of diameter 0.50 m and length 20 m is subjected to a lateral load of 4,000 N and a moment of 2000 N-m at the ground level. Taking ɖh = 12,000 kN/m^3, find maximum bending moment and maximum deflection if the head of the pile is considered to be free end.
Take E= 3 X 10^6 N/cm^2

07

Z	Ay	By	Am	Bm
0	2.435	1.623	0.000	1.000
0.5	1.644	0.873	0.459	0.976
0.6	1.496	0.752	0.532	0.960
0.7	1.353	0.642	0.597	0.939
0.8	1.216	0.540	0.649	0.914
0.9	1.086	0.448	0.693	0.885
1.0	0.962	0.364	0.727	0.852
1.2	0.738	0.223	0.767	0.775

Q.4 **(a)** For determining the dynamic soil properties, describe Block Vibration Test with schematic diagram. **07**

(b) A Cyclic plate load test was carried out on a deposit of silty sand to estimate the elastic coefficients for the design of a compressor foundation. The test was carried out at a depth of 3m, using a 30cm X 30cm test plate. The data obtained was: **07**

Load intensity(kN/m^2)	25	0	50	0	75	0	100	0	150	0	200	0	250	0
Settlement(mm)	0.5	0.4	0.95	0.8	1.6	1.25	2.5	1.9	3.6	2.6	4.8	3.8	6.7	4.9

Plot the stress versus elastic settlement relationship and determine the values of C_u, $C_ć$ and $C_Ø$ for $10m^2$ base area.

OR

Q.4 **(a)** Write a short note on under-reamed piles. Under which situations you would prefer to use these piles. **07**

(b) Assuming resonance to have occurred at the frequency of 24 cycles/second in a vertical vibration of a test block, 1.0 X 1.0 X 1.0m size, determine the coefficient of elastic uniform in compression (C_u). The weight of oscillator is 66kg and the force produced by it at 12 cycles per second is 100 kg. Also compute the maximum amplitude in vertical direction at 12 cycles per second. **07**

Q.5 **(a)** Enlist various forces acting on well foundation. Explain stability analysis of well foundation. **07**

(b) Design a gravity retaining wall, 6m high with vertical back to retain a dry cohesionless backfill of unit weight $17kN/m^3$ and angle of shearing resistance 30°. The wall is to be 1m wide at top, and to be constructed of brick masonry having unit weight $20kN/m^3$. Use Rankineôs theory. **07**

OR

Q.5 **(a)** What do you understand by Soil improvement? Explain the different techniques of soil improvement. **07**

(b) In which circumstances the strap footing will be useful? State important considerations for the strap footing. **07**

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