2 m below ground level. The water table is also at a depth of 2 m from the ground level. If the water table rises by 1 m, calculate the percentage reduction in the ultimate bearing capacity.

(c) In a 16 pile group, the pile diameter is 45 cm and centre to centre spacing of the square group is 1.5 m. If c = 50 kN/m^2, determine whether the failure would occur with the pile acting individually, or as a group? Neglect bearing at the tip of the pile. All piles are 10 m long. Take m= 0.7 for shear mobilization around each pile.

5 Attempt any two : 10×2

(a) Resonance occurred at a frequency of 22 cycles per second in a vertical vibration test of a block 1 m × 1 m × 1 m. Determine the coefficient of elastic uniform in compression of the soil given that the weight of the oscillator in 65 kg and that the force produced by it at 12 cycles per second is 100 kg. Also compute the amplitude in vertical direction at 2 cycles per second.

(b) Using Barken's expressions for natural frequency and the amplitude of vibrations, calculate the change in the percentage amplitude in terms of r if the soil mass participating in the vibrations is 23 % of m. Also, calculate this change for r = 0.3 and r = 2.

(c) A strip footing 1.2 m wide is located at a depth of 1.5 m in a non – cohesive soil deposit for which the corrected N-value of SPT is 20. Water table is located at a depth of 2 m below the ground surface. Find the allowable bearing pressure for the soil.

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Paper ID and Roll No. to be filled in your Answer Book

Roll No.

B. Tech.

(SEM. VI) (EVEN SEM.) EXAMINATION, 2013

FOUNDATION ENGINEERING

Time : 3 Hours] [Total Marks : 70

Note: Attempt all questions, the marks assigned to each question is indicated at question itself.

1 Attempt any four : 5×4

(a) Explain the different methods of site exploration in detail. Give the important parameter to fix the significant depth of exploration.

(b) What are the different types of shear failures? Explain with the help of labelled diagram.

(c) Explain the factors governing the spacing, depth and number of bore holes for a multi-storied building project.

(d) What are the corrections required for SPT- N value.

(e) A retaining wall 6 m high, with vertical back, supports a cohesive backfill having unit weight = 19 kN/m^3, apparent cohesion = 26 kN/m^2 and angle of internal friction zero. Calculate (a) internal pressure intensity at the top of the wall, (b) depth of tension cracks (c) Lateral pressure intensity at the base.

(f) Describe Culmann's graphical method for active pressure.

2 Attempt any four : 5×4

(a) What is shallow foundation? Explain its types?

(b) What is bearing capacity? What are the factors affecting bearing capacity? what are improving factors of bearing capacity?

(c) Explain Terzaghi's analysis of bearing capacity of soil in general shear failure.

(d) Determine the net bearing pressure for a 2 m × 2 m footing at a depth of 1.5 m in a medium dense sand so that the total settlement does not exceed 25 mm. The average SPT blows below the footing are 20 per 30 cm. The average moist unit weight of soil is 17 kN/m^3. The water table is at 5 m below the ground level. What will be the bearing pressure if the water table rises upto the base of the footing.

(e) Size of an isolated footing is to be limited to 1.5 metres square. Calculate the depth at which the footing should be placed to take a load of 200 kN, with a factor of safety 3. The soil is having angle of internal friction $\phi = 30°$. The weight of the soil is 21 kN/m^3. Bearing capacity factor for $\phi = 30°$, $Nq = 22$ and $N_y = 20$.

3 Attempt any two : 10×2

(a) A group of 9 piles arranged in a square pattern with diameter and length of each pile as 25 cm and 10 m respectively, is used as a foundation in soft clay deposit. Taking the unconfined compressive strength of clay as 120 kN/m^2 and pile spacing as 100 cm centre to centre, find the load capacity of the group. Assume the bearing capacity factor $N_c = 9$ and adhesion factor = 0.75. A factor of safety 2.5 may be taken.

(b) A single acting steam hammer weighing 2000 N and falling through a height of 80 cm drives a pile to an average penetration of 1 cm per blow under the last few blows. Determine the allowable load for the pile, using Engineering News formula.

(c) A footing rests at a depth of 1m has a size of 3m × 1.5m and it causes a pressure increment of 200 kN/m^2 at its base. The soil profile at the site consists of sand for the top 3 m, which is underlined by a clay layer of 3m. Water table is at a depth of 2.5m from the ground surface. The unit weight of sand layer above and below water table are 16kN/m^3 and 18 kN/m^3 respectively. The unit weight of clay is 15 kN/m^3. The initial void ratio is 0.8 and compression index is 0.3. Determine the consolidation settlement at the middle of the clay layer. Assume 2:1 pressure distribution and consider the variation of pressure across the depth of the clay layer.

4 Attempt any two : 10×2

(a) A square footing 1.2 m × 1.2 m rests at a depth of 1 m in a saturated clay layer 4 m deep. The clay is normally consolidated, having an unconfined compressive strength of 40 kN/m^2. The soil has a liquid limit of 30% , y_{sat} = 17.8 kN/m^3, w = 28% and G = 2.68. Determine the load which the footing can carry safely with a factor of safety of 3 against shear. Also, determine the settlement if the footing is loaded with this safe load. Use terzaghi's analysis for bearing capacity.

(b) Using terzaghi theory, determine the ultimate bearing capacity of a strip footing 1.5 m wide resting on a saturated clay (C_u= 30kN/m^2, $\phi_u = 0$ and , y_{sat} = 20 kN/m^3) at a depth of