Reg. No. :

Question Paper Code : 71257

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Civil Engineering

CE 2305/CE 54/10111 CE 505 — FOUNDATION ENGINEERING

(Regulation 2008/2010)

(Common to PTCE 2305/10111 CE 505 – Foundation Engineering for B.E. (Part-Time) Fifth Semester, Civil Engineering – Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Note: IS 6403 – 1981 Code book may be permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate : Non representative and undisturbed samples.

2. How do you decide the depth of exploration? List the factors you will consider.

3. What factors determine whether a foundation type is shallow or deep?

4. Why are hearing capacity equations for clay usually the undrained shear strength?

5. Indicate the circumstances under which combined footings are adopted.

6. List and sketch different type of mat foundations.

7. What type of piles would you recommend for the following types of soil and site conditions?

   (a) For a multi-storeyed building in the central part of a city surrounded by existing buildings.

   (b) For a harbour structure.

8. Does the choice of a pile hammer have any relevance to the type of pile? Give reasons.

9. Why only granular materials are preferred for the backfill of a retaining wall?

10. How do tension cracks influence the distribution of active earth pressure in pure cohesion?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss briefly the methods of taking undisturbed samples in non-cohesive soils and cohesive soil. (4 + 4)

(ii) A 70 storey building has an imprint of 35 m × 25 m and will be supported on a mat foundation located at a depth of 10 m. How many boring would you propose and to what depth? Where would you place the borings on the building plan view. (8)

Or

(b) Assume that the blown count shown in Table 1 is an uncorrected blow count profile obtained for a silty sand. Assume further that the energy recorded during these SPT test was 332 J, that the ground water level was at the surface. Create the corrected profile for energy level N_{60}, the corrected profile for stress level N_1 and the corrected profile for silt content N'. Then create the combined corrected profile for energy, stress level, and silt content N_1' 60. (16)

Table 1

SPT Values

Depth (m)	1.5	3	4.5	6
N measured	15	20	17	12
Energy (J) measured	332	332	332	332

Assume relevant γ_{sat}.

12. (a) (i) Differentiate : Safe Bearing Capacity, Allowable Bearing Capacity, Allowable bearing pressure. (6)

(ii) A circular concrete pier of 3 m diameter carries a gross load of 3,500 kN. The supporting soil is a clayey sand having the following properties : C = 5 kN/m², $\phi = 30^\circ$ and $\gamma = 18.5$ kN/m³. Find the depth at which the peer is to be located such that a factor of safety of 3.0 is assumed. The bearing capacity factors for $\phi = 30^\circ$ are $N_c = 30.1$, $N_q = 18.4$ and $N_\gamma = 22.4$. (10)

Or

(b) (i) Draw Terzaghi's bearing capacity failure surface with all details. (4)

(ii) The results of a plate load test conducted on a 300 mm square plate at a depth of 1 m on a dry sand is given below.

Unit applied pressure (kN/m²)	50	100	150	200	250	300	350
Settlement (mm)	3	5	98	13	19	28	65.0

Determine the ultimate bearing capacity the safe bearing capacity (F.S = 3). The size of square footing to be placed at the same depth and to carry a load of 2500 N and the settlement of the footing.

13. (a) (i) Draw the contact pressure distribution below flexible and rigid footing resting on sandy deposits. Also draw the settlement pattern also. Explain. (8)

(ii) Column loads on Columns A and B are 1920 kN and 1500 kN respectively. Column B is a boundary column. Proportion a trapezoidal footing. The allowable soil pressure is 200 kPa. (8)

Or

(b) (i) What is meant by floating foundation? List the different types. List the problems that are encountered during executions. Also brief how they are managed? (8)

(ii) It is decided to provide a strap footing for two columns A and B as detailed below :

Column loads : Load on A : 1500 kN,

Load on B = 1450 kN.

Size of column : 0.5 m

Centre to centre of column : 5.8 m

Allowable soil pressure : 370 kN/m². (8)

14. (a) (i) Group the pile foundation based on method of installation and its effect on ground. (6)

(ii) In a two-layered cohesive soil, bored piles of 400 mm are installed. The top layer has a thickness of 5 m and the bottom one is of considerable depth. The shear strength of the top clay layer is 45 kN/m² and that of the bottom is 100 kN/m². Determine the length of the bored pile required to carry a safe load of 380 kN, allowing a factor of safety 2.5.

Or

(b) (i) What is meant by under-reamed pile. When and where they are used. Why? Discuss. (8)

(ii) A 4 × 3 pile group has the following details :

Diameter of each pile, $d = 350$ mm

Centre-to-centre spacing of pile = 1,050 mm

Capacity of a single pile = 400 kN

Determine the efficiency of the free-standing pile group. (8)

15. (a) A vertical retaining wall of height 6.5 m retains a non-cohesive level backfill weighing 19.2 kN/m³, with the angle of friction being 18°. Compute the total thrust on the wall adopting Culmann's graphical method. Later it is planned to place a piece of machinery weighing 30 kN on the surface, parallel to the crest of the wall. Find the minimum horizontal distance from the back of the wall at which the machinery could be placed without increasing the pressure on the wall. Take $\phi = 30°$. (16)

Or

(b) For the cantilever retaining wall shown in fig.15(b), determine the maximum and minimum pressure under the base of the cantilever. The relevant shear strength parameters of the backfill and foundation soil are $C' = 0$, $\phi = 35°$ and unit weight of the soil $\gamma = 17.5$ kN/m³. The unit weight of the wall material is 23.5 kN/m³. Find also the factor of safety against sliding, considering the reduced value of base friction as $\frac{2}{3}\phi$.

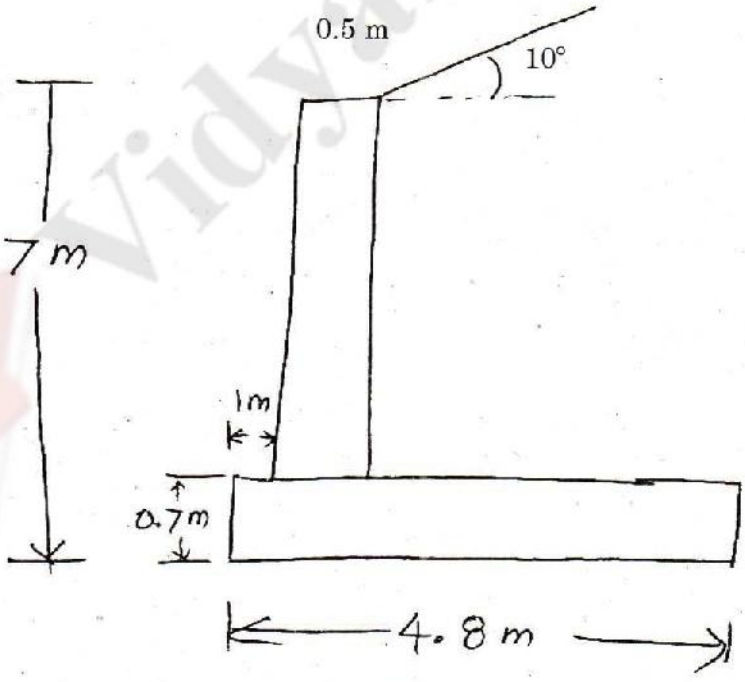

fig.15(b)