Code : 011722

B.Tech 7th Semester Examination, 2016

Foundation Engineering

Time : 3 hours *Full Marks : 70*

Instructions :

*(i) There are **Nine** Questions in this Paper.*

*(ii) Attempt **Five** questions in all.*

*(iii) **Question No. 1 is Compulsory.***

(iv) The marks are indicated in the right-hand margin.

1. Answer any seven question from the following: 2×7=14

(a) The main advantage of percussion drilling is:

(i) It can be used in all types of soil/rock.

(ii) There is minimum disturbance to the soil

(iii) It is economical for bore holes of diameter less than 100 mm.

(iv) All of these

(b) The area ratio of a good soil sampler should be less than:

(i) 20% for stiff soils, 10% for soft clays

(ii) 10% for stiff soils, 20% for soft clays

(iii) 10% for both stiff soils and soft clays

(iv) 20% for both stiff soils and soft clays

P.T.O.

(c) In a standard penetration test (SPT). 54 blows were required to drive 15 cm beyond seating drive, the N value of she soil is:

(i) 25

(ii) 27

(iii) 54

(iv) Refusal

(d) The increasing order of magnitude of swelling in expensive soils due to various clay minerals:

(i) Kaolinite < Halloysite < illite < Ca montmorillonite < Na montmorillonite

(ii) Kaolinite < Halloysite < illite < Na montmorillonite < montmorillonite

(iii) Halloysite < Kaolinite < illite < Na montmorillonite < Ca montmorillonite

(iv) Kaolinite < illite < Halloysite < Ca montmorillonite < Na montmorillonite.

(e) In a free-swell test, the soil occupied a volume of 20 cm^3 in distilled water and 12 cm^3 in kerosene. The free-swell index of the soil sample is:

(i) 1.2%

(ii) 60%

(iii) 66.7%

(iv) 166.7%

(f) When representing the vibrations of the machine foundation by simple harmonic motion, the displacements are proportional to

(i) ωt

(ii) cos ωt

(iii) sin ωt

(iv) tan ωt

(g) The two criteria for the the determination of allowable bearing capacity of a foundation are:

(i) Tensile failure and compression failure

(ii) Bond failure and shear failure

(iii) Tensile failure and settlement

(iv) Shear failure and settlement

(h) The width and depth of footing are 2.0 and 1.0 m respectively. The water table at the site is at a depth of 3 m below the ground level. The water table correction factor for the calculation of the bearing capacity of soil is:

(i) 1.000

(ii) 0.875

(iii) 0.750

(iv) 0.500

(i) In dynamic cone penetration test, the weight of hammer used for driving the cone is:

(i) 63.5 kgf

(ii) 65.0 kgf

(iii) 68.5 kgf

(iv) 75.0 kgf

(j) The minimum grade of concrete for well crub in a well foundation is:

(i) M15

(ii) M20

(iii) M25

(iv) M30

2. (a) What are the steps involved in the planning and execution of soil exploration? Discuss in detail.

(b) Indicate different types of samplers. Describe the split spoon sampler with the help of a neat sketch. 7+7

3. (a) Discuss the effect of water table, size and depth of foundation on bearing capacity. Also differentiate between Terzaghi's and Mayerhof's bearing capacity theories. 7

(b) A square footing has to carry a load of 1000 kN. Find the size of the footing for a factor of safety of 2.50. The depth of the foundation is 1.5 m the soil has the following properties: G=2.60, e=0.50, ϕ=30° and C=10 kN/m². What will be the safe bearing capacity and size of footing if the water table rises to ground level. For ϕ=30°, N_c=30.0, N_q=18.4, N_γ=22.4. 7

4. (a) Explain the method of determination of the natural frequency of machine foundation-soil system. 7

(b) A machine weighing 2.0 kN undergoes a damped vibration due to a periodic force of magnitude 100 N. The machine is uniformly supported by 4 springs, each having a stiffness of 12 kN/m. The damping coefficient of the system is estimated as 800 N-s/m. determine the resonant frequency and resonant amplitude of the system. 7

5 (a) What is an expansive soil? Briefly describe the major problems caused by them. 7

(b) Sketch and list out the component of well foundation and discuss their functions. 7

6. (a) Discuss the detail the classification of pile foundations.

(b) A group of 12 short piles, each having a diameter of 500 mm and an embedded length of 8 m, supports the platform. The piles are arranged in 3 identical rows and are spaced at 1.75 m from each other. The subsoil has the following properties:

$\gamma_{sat} = 21.0 \text{N/m}^3, \Phi = 0°, \text{C} = 37.5$ kPa and $\alpha = 0.72$

Determine the safe axial load carrying capacity of the pile group. 7

7. (a) Explain with a neat sketch how dynamic cone penetration test is carried out in the field. 7

(b) The following data was obtained from a plate load test carried out on a 60 cm square test plate at a depth of 2.0 m below ground surface on a sandy soil which extends up to a large depth. Determine the settlement of a foundation 3.0 m × 3.0 m carrying a load of 110 t and located at depth of 3 m below ground surface. 7

Load test data:

Load intensity, t/m²	5	10	15	20	25	30	35	40
Settlement, mm	2.0	4.0	7.5	11.0	16.3	23.5	34.0	45.0

Water table is located at a large depth from the ground surface.

8. What is a coffer dam? What are the different types of coffer dam? What are their relative merits and demerits? 14

9. (a) State the modified Hiley's formula for axial load carrying capacity of a pile. Explain all the notations used there in.

(b) The field N value in a deposit of fully submerged fine sand was 40 at depth of 6 m. The average saturated unit weight of the soil is 19 kN/m^3. Calculate the corrected N value as per IS 2131-1981.

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