# Code : 011722

## B.Tech 7th Semester Exam., 2020

## FOUNDATION ENGINEERING

*Time* : 3 hours *Full Marks* : 70

*Instructions* :

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

*(ii) There are* ***NINE*** *questions in this paper.*

*(iii) Attempt* ***FIVE*** *questions in all.*

*(iv) Question No.* ***1*** *is compulsory.*

**1.** Choose the correct answer of the following (any *seven*) : 2×7=14

*(a)* What is the internal diameter of sampling tube if external diameter is 75 mm and area ratio of sampling tube is 20%?

*(i)* 70 mm

*(ii)* 68·5 mm

*(iii)* 65 mm

*(iv)* 60 mm





*(b)* The main advantage of percussion drilling is

*(i)* it can be used in all types of soil and rock

*(ii)* there is minimum disturbance of the soil

*(iii)* it is economical for advancing bore holes of diameter less than 100 mm

*(iv)* All of the above

*(c)* Static cone penetration test is suitable for

*(i)* clay

*(ii)* fine sand

*(iii)* silt

*(iv)* All of the above

*(d)* The ultimate bearing capacity of a square footing on the surface of a saturated clay having unconfined compressive strength of $50 kN/m^2$ is (using Skempton equation)

*(i)* $50\ kN/m^2$

*(ii)* $100\ kN/m^2$

*(iii)* $125\ kN/m^2$

*(iv)* $150\ kN/m^2$

(e) As per IS : 1904(1986), the minimum depth of foundation is

(i) 0·5 m

(ii) 0·75 m

(iii) 0·25 m

(iv) 1·5 m

(f) Steel piles are mainly intended to carry

(i) light loads

(ii) heavy loads

(iii) medium loads

(iv) None of the above

(g) Box caissons are

(i) open at both top and bottom

(ii) closed at both top and bottom

(iii) closed at top and open at bottom

(iv) open at top and closed at bottom





(h) The seated load applied on the test plate in a plate load test before applied the actual load is

(i) $50\,g/cm^2$

(ii) $60\,g/cm^2$

(iii) $70\,g/cm^2$

(iv) $80\,g/cm^2$

(i) Which of the following relations is correct?

(i) $C_c = 2\sqrt{\frac{k}{m}}$

(ii) $C_c = 4\pi f_n m$

(iii) $C_c = 2\pi \omega_n m$

(iv) $C_c = \frac{1}{2}\pi f_n m$

(j) Pile foundation are provided to

(i) carry loads

(ii) resist horizontal and uplift forces

(iii) compact a loose cohesionless deposit

(iv) All of the above

2. (a) What is the purpose of a soil investigation programme? Explain the different stages of the investigation. 8

(b) Explain inside clearance, outside clearance and area ratio. 6

3. (a) What is the *N* value of SPT? Explain the corrections to be applied to the observed value of *N*. 8

(b) A square test plate of 30 cm, settles 15 mm under a load of 4 kN in a sandy soil. By how much will a footing of 2 m × 2 m subjected to a load of 200 kN settle? 6

4. (a) State the assumptions of Terzaghi's bearing capacity analysis. 6

(b) With the help of neat sketches, explain the different types of foundation. 8

5. (a) How are piles classified on the basis of function and material? 8





(b) A group of 16 piles of 50 cm in diameter is arranged with a center-to-center spacing of 1·2 m. The piles are 10 m long and are embedded in soft clay with cohesion 30 kN/m$^2$. Bearing resistance may be neglected for the piles. Adhesion factor is 0·6. Determine the ultimate bearing capacity of the pile group. 6

6. Describe the various components of a pneumatic caisson with a neat sketch. Enumerate the advantages and disadvantages of pneumatic caisson. 14

7. (a) Define the following terms : 6

(i) Frequency ratio

(ii) Resonant frequency

(iii) Damping effect

(b) Determine the natural frequency of a machine foundation which has a base area of 2·5 m × 2·5 m and a weight of 160 kN including the weight of the machine. Take the value of the coefficient of elastic uniform compression as 4·5 × 104 kN/m$^3$. 8

8. *(a)* Discuss the various measures which are adopted while planning the construction of structures on collapsible soil fills. 10

   *(b)* Write a short note on 'foundations on sanitary landfill sites'. 4

9. What is the significance of permissible settlement? State the permissible settlement of isolated and raft foundation in clayey and sandy soils. 14

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