Bihar Engineering University, Patna End Semester Examination - 2022

Course: B.Tech. Code: 101722

Semester: VII Subject: Foundation Engineering

Time: 03 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

Q.1 Choose the correct answer of the following: (Any Seven)

 $[2 \times 7 = 14]$

- (a) Trapezoidal combined footings are required when
 - I. Space outside exterior column is limited
 - II. Exterior column is heavier
 - III, Both (i) and (ii)
 - IV. Neither (i) nor (ii)
- (b) Influence factor for immediate settlement of footings depends on its
 - I. Size and shape
 - II. Rigidity alone
 - III. Location
 - IV. All of the above \checkmark
- (c) Which of the following piles is used for the lateral loads coming on the structure?
 - I. Fender pile
 - II. Batter pile _
 - III. Compaction pile
 - IV. Displacement pile
- (d) 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
- (e) The net ultimate bearing capacity of a purely cohesive soil
 - I. Depends on the width of the footing and is independent of the depth of the footing.
 - II. Depends on the width as well as the depth of the footing
 - III. Depends on the depth, but is independent of the width of the footing.
 - IV. Is independent of both the width and depth of the footing.
- (f) A well caisson is a foundation facilating structure sunk in the ground or water, which is:
 - I. Open at top as well as at bottom
 - II. Open at top and closed at bottom
 - Open at bottom and closed at top
 - IV. Closed at top as well as at bottom
- (g) In under reamed pile construction, the minimum centre to centre spacing between two adjacent bulbs is equal to
 - I. Diameter of bulb
 - II. 1.5 x Diameter of bulb
 - III. 2 x Diameter of bulb
 - IV. 2.5 x Diameter of bulb
- (h) In the case of footing on the surface or shallow depth in very dense sand which one of the following types of failure is likely to occur?
 - I. Punching shear failure
 - II. Local shear failure
 - III. General shear failure

None of the above The working chamber of pneumatic caissons are kept airtight because...... (i) To avoid tilting I. To remove the soil II. To prevent water from entering the chamber \checkmark None of the above IV. Quick sand is a (j) Type of sand I. Flow condition occurring in cohesive soils II. Flow condition occurring in cohesion-less soils 🗸 III. Flow condition occurring in both cohesive and cohesion-less soils 171 A 40 cm diameter pile, 12 m long, has a bell of 2.5 m diameter and 1 m height. If the soil has Discuss the sharing of loads in a pile group Q.2(a) $\phi' = 25^{\circ}$, $c_u = 25 \text{ kN/m}^2$ and $\gamma = 18 \text{ kN/m}^3$ estimate the allowable pull out resistance (FS = 3). (b) Take the value of $H/B_1 = 3.0$ and $s_f = 1.3$ Discuss the situations where a well foundation is more suitable than the other types of Q.3 (a) [7] foundations. [7] What are the different shapes of well? (b) What is the N value of SPT? Explain the corrections to be applied to the observed value of N. [7] What will be the gross and net safe bearing pressure of sand having $\phi = 36^{\circ}$ and effective unit [7] weight 1.8 tonnes/m3 under the following cases: 1 m wide strip footing (i) 1 m x 1 m square footing \checkmark (ii) Consider the footings are placed at a depth of 1 m from ground surface and water table is at a great depth. Assume a factor of safety of $\overline{3.0}$. Use Terzaghi's theory. Given for $\phi =$ 36° from Terzaghi's chart $N_q = 47$ and $N_{\gamma} = 43$. Explain the field penetration test of SPT, and DCPT methods in soil exploration. [7] 0.5 (a) [7] Explain briefly the group action and efficiency of pile group. (b) A raft foundation is supported by pile group consisting of 15 piles arranged in 3 rows. The

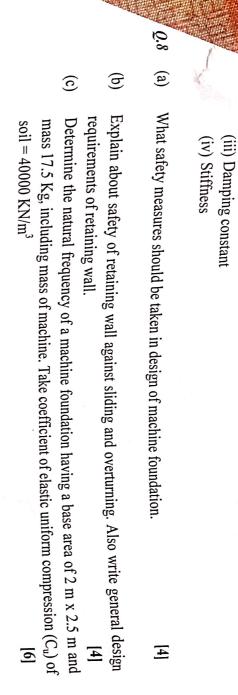
- Q.6 (a) A raft foundation is supported by pile group consisting of 15 piles arranged in 3 rows. The diameter and length of each pile are 300 mm and 15 m respectively. The spacing between the piles is 1.2 m. The foundation soil consists of a soft cally layer having c = 3.2t/m² and Y = 1.9t/m². Determine the capacity of the pile group. [7]
 - (b) A timber pile is being driven with a drop hammer weighing 20 kN and having a free fall of 1m.

 The total penetration of the pile is the last five blows is 30 mm. Determine the load carrying of the pile using the Engineering News Formula.

 [7]
- Q.7 (a) Describe the three of following-

[7]

- (i) Critical Damping
- (ii) Viscous Damping
- (iii) Resonant Frequency
- (iv) Free Vibration without damping
- (v) Forced vibration with damping
- (b) Amplitude of vibration of a SDOF system whose natural frequency 2 Hz and mass 100 Kg vibrating freely gets reduced to 80% after 3 seconds vibration. Calculate the following.
 - (i) Fraction of Critical damping
 - (ii) Logarithmic decrement



Write short notes on any four of the following:-

[3.5x4]

Under reamed pile

Consolidation in soil

Group action of pile ,

Types of foundation ,

Effect of water table on bearing capacity of shallow foundation