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**18CV823**

## Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024
## Advanced Foundation Engineering

Time: 3 hrs.

Max. Marks: 100

**Note:** *Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

**1**  a. Explain the Brinch Hansen's bearing capacity theory. **(08 Marks)**
   b. With neat sketch, explain the different modes of shear failure. **(06 Marks)**
   c. Explain the effect of water table on the bearing capacity of soil. **(06 Marks)**

**OR**

**2**  a. With formula and notation explain the types of foundation settlement. **(10 Marks)**
   b. A rectangular footing 2m × 3m rests on C - φ soil with its base at 1.5m below the ground surface. Calculate the safe bearing capacity using a factor of safety of 3 and
   i) Net ultimate bearing capacity     ii) Ultimate bearing capacity.
   The soil has following parameters :   $\gamma = 18kN/m^3$ ,   $C = 10kN/m^2$ ,   $\phi = 30^\circ$.
   Use Terzaghi's analysis. Take $N_c = 37.2$ ,  $N_q = 22.5$ ,  $N_\gamma = 19.7$. **(10 Marks)**

### Module-2

**3**  a. Explain the design of Trapezoidal combined footing. **(10 Marks)**
   b. What is meant by modulus of sub – grade reaction? On what factor does it depend? **(10 Marks)**

**OR**

**4**  a. What are the different types of Rafts and explain the design procedure of raft foundation by conventional method. **(10 Marks)**
   b. Proportion a rectangular combined footing for uniform pressure under dead load plus reduced live load. The following data :
   Allowable soil pressure :  DL + Reduced LL = $150kN/m^2$
   DL + Reduced LL = $225 kN/m^2$

   | Column Loads : | Column A | Column B |
   |---|---|---|
   | Dead load | 540 kN | 690 kN |
   | Live load | 400 kN | 810 kN |

   The distance between column = 5.4m.
   Projection of footing beyond column A = 0.5m. **(10 Marks)**

### Module-3

**5**  a. Under what circumstance the pile foundation preferred? **(06 Marks)**
   b. With a neat sketch, explain Under – reamed pile. **(06 Marks)**
   c. Explain the load carrying capacity of single pile by static formula. **(08 Marks)**

**OR**

**6**  a. What is Negative skin friction? How it can be eliminated? **(06 Marks)**
   b. With neat diagram, explain pile load test. **(06 Marks)**

c. A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30cm and 9m respectively. If the unconfined compressive strength of clay is $90kN/m^2$ and pile spacing is 90cm. What is the capacity of pile group? Assume factor of safety 2.5 and adhesion factor of 0.75. **(08 Marks)**

## Module-4

7  a. List and explain different shapes of wells. **(06 Marks)**
   b. Explain the components of well foundation. **(06 Marks)**
   c. List the types of Caisson's and explain the advantages and disadvantages of pneumatic Caisson's. **(08 Marks)**

**OR**

8  a. Explain the construction of drilled pier. **(08 Marks)**
   b. Explain in detail the sinking of well. **(12 Marks)**

## Module-5

9  a. Derive an expression for vibration motion of a single degree of freedom system under undamped free vibration. **(12 Marks)**
   b. What are the general criteria for design of machine foundation? **(08 Marks)**

**OR**

10 a. Define : i) Single degree freedom   ii) Viscous damping   iii) Free vibration   iv) Forced vibration   v) Natural frequency. **(12 Marks)**
   b. Determine the co-efficient of uniform compression if a vibration test on a block $1m \times 1m \times 1m$ gave a resonance frequency of 30Hz in the vertical direction. The mass of oscillator used was 60kg. **(08 Marks)**

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