Paper / Subject Code: 59002 / Foundation Analysis & Design

M.E.Civil Engg. Structural Engg Subject (Sem. I)(Choice Base) / 59002 - Foundation Analysis & Design.

(3 Hours)   **Total Marks: 80**

N N. B. (1) Answer any **four** questions,

   (2) Neat diagrams must be drawn wherever necessary

  (3) Assume suitable data if required and state it clearly.

Qu. 1 a) Describe the various shear failures as per Vesic.   5

b) Under which conditions pile foundation will be provided.   5

c) What is negative skin friction? Explain with neat sketch. What is its effect on the pile capacity?   5

d) Explain any five shapes of machine foundation with neat sketch.   5

Qu. 2: a) A circular well has an external diameter of 7.5m and sunk into sandy soil to a depth of 20m below the maximum scour depth. The resultant horizontal force is 1450 kN and the well is subjected to a moment of 35000 kN-m. Determine the safety of well against lateral force, assuming the well rotate i) About a point above the base and ii) About the base. Assume $\gamma' = 12$ kN/m^3, $\Phi = 30^0$. Use Terzaghi's analysis and a safety 2.5 against passive resistance.   14

b) Write a design processes of Wharf.   6

Qu.3: a) A square column foundation is to be designed for a gross allowable total load of 500 kN. If the load is inclined at an angle of 10^0 to the vertical, determine the width of the foundation. Take a factor of safety of 2.5 and Use Vesic's equation. Take $\gamma = 20$ kN/m^3, $\Phi = 32^0$, c= 5 kN/m^2 and the depth of foundation is 1.25 m.   10

b) A under tuned machine of weight 650 kg with minimum area of base plate as 75 cm x 75 cm with an operating frequency as 900 rpm. Design the machine foundation using Tschebotarioff's reduced natural frequency method for different soils with G= 80 Kg/cm^2 and G=140 kg/cm^2. .   10

Qu. 4: a) A 1.2mx1.2m footing carrying a load of 1200 kN rests on a normally consolidated saturated clay layer 10 m thick below which hard rock exist. The life span of the structure is 150 years. Time taken for the completion of primary consolidation of 30mm thick laboratory specimen with double drainage facility is 30 minutes. Find the total settlement by using the following properties of soil;

Soil modulus = 20 MPa, Poisson's ratio =0.4, Influence factor =0.9, Liquid Limit = 50%, Natural water content = 30%, Specific gravity of grains= 2.7, Saturated density = 22 kN/m^2 and Coefficient of secondary compression 0.001. **14**

b) Discus the Meyerhof's bearing capacity theory. How does it differ from the Terzaghi's theory? **6**

Qu. 5: a) What is scour depth? How score depth was calculated? What do you understand by grip length **8**

b) A circular well has an external diameter of 7.5m and sunk into sandy soil to a depth of 10m below the maximum scour depth. The resultant horizontal force is 1800 kN and the well is subjected to a moment of 25000 kN-m. Determine the safety of well against lateral force, assuming the well is i) rotate about a point above the base and ii) about the base. Assume $\gamma' = 10$kN/m^3, $\Phi = 32^0$. Use Terzaghi's analysis and a safety 2.0 against passive resistance. **12**

Qu. 6: a) Explain cellular coffer dams with neat sketch. **4**

b) Explain sharing of a load in a pile group if i) load is axial, ii) load eccentric about one axis and iii) load eccentric about both the axes. **4**

c) What is stress isobar? What is the effect of stress isobar in case of a closely and widely spaced pile group? **4**

d) Explain the floating foundation. **4**

e) Explain, a) Reciprocating machine and b) Impact machine. **4**

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