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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(SE) (E-I) (Sem.-2)
ADVANCED FOUNDATION ENGINEERING
Subject Code : CE-510
Paper ID : [E0855]

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

- Q1) a) What are the conditions where a pile foundation is more suitable than a shallow foundation?
- b) A bored pile in a clayey soil failed at an ultimate load of 400 kN. If the pile is 40 cm in diameter and 10 m long, determine the capacity of a group of 9 piles, spaced 1 m centre to centre both ways. Take $\alpha = 0.5$.
- Q2) a) Sketch a typical cross-section of well foundation and indicate the forces acting on it.
- b) What do you mean by tilt and shift in well foundation? How would you rectify tilt and shift while sinking a well foundation? Discuss with neat sketches.
- Q3) A depth of 5.0 is to be retained by a cantilever sheet pile wall to be driven into the same subsoil having $\phi=32^\circ$ and unit weight of 16.5 kN/m^3 . Determine the minimum depth of penetration for static equilibrium, if the sheet pile wall is anchored at the ground (top) level. Also compute tension in the anchor rod per unit length of the wall. Draw net pressure diagram.
- Q4) a) What are the assumptions of Terzaghi's bearing capacity equation? Also derive the Terzaghi's bearing capacity equation.
- b) Describe plate-load test. What are its limitations and uses?
- Q5) a) Describe the methods for the determination of the mass, spring constant, damping factor and the mass of participating soil.
- b) The foundation for a gas engine with a vertical cylinder and vertically oscillating parts has the following data : Total mass of engine = 5 Mg, Speed of rotation = 300 r.p.m., Mass of block = 20 Mg, Mass of participating soil = 25 Mg. Spring stiffness = $60 \times 10^4 \text{ kN/m}$. Determine the natural frequency and maximum amplitude. Take $D = 0.1$. The unbalanced vertical force is 12 kN.

- Q6) a) Explain in detail types of shear failure with suitable diagrams.
- b) Estimate the immediate settlement of a concrete footing, $1\text{ m} \times 2\text{ m}$ size, founded at a depth of 1 m in a soil with $E = 10^4 \text{ kN/m}^2$, $\mu = 0.3$. The footing is subjected to a pressure of 200 kN/m^2 . Assume the footing to be rigid.
- Q7) a) What is negative skin friction? What is its effect on the pile?
- b) What are different types of sheet pile walls? Draw the sketches showing the pressure distribution.
- Q8) Write short notes on the following :
- a) Cofferdam
 - b) Pile cap
 - c) Caisson
 - d) Floating foundation