

B TECH
(SEM VI) THEORY EXAMINATION 2017-18
ADVANCED FOUNDATION DESIGN

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20
- a. What is contact pressure?
 - b. What do you understand by geostatic stresses?
 - c. Define net safe bearing capacity.
 - d. Write the effect of water table on the bearing capacity of the soil.
 - e. Define the 'group efficiency factor' of a pile group and list the factors influencing the efficiency of a pile group.
 - f. What are the different shapes of wells?
 - g. If an expansive soil is susceptible to wetting, what preventive measures would you take?
 - h. What is swell pressure?
 - i. What is meant by vibration isolation?
 - j. What are the assumptions that are generally made in the analysis of the stability of slope?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30
- a. A long flexible strip footing of 2.5 m width having a smooth base is subjected to a uniformly distributed load of 80 KN/m run. Determine the vertical stress intensities at a depth of 2 m below a line parallel to the centre line of the footing at a distance of 3 m from it.
Also draw a Newmark's influence chart on the basis of Boussinesq's equation, for an influence factor of 0.005.
 - b. Differentiate between the general shear failure and the local shear failure. How the ultimate bearing capacity in local shear is determined?
 - c. A precast concrete pile (35 cm x 35 cm) is driven by a single acting steam hammer. Estimate the allowable load using (a) Engineering News Record Formula (F.S. = 6), (b). Hiley Formula (F.S.= 4), (c) Danish formula (F.S. = 4). Use the following data:

| | |
|-------------------------------|--------------|
| Maximum Rated Energy | = 3500 KN-cm |
| Weight of Hammer | = 35 KN |
| Length of pile | = 15 m |
| Efficiency of Hammer | = 0.8 |
| Coefficient of resititution | = 0.5 |
| Weight of pile cap | = 3 KN |
| No. of blows for last 25.4 mm | = 6 |
 - d. Explain the terms used in well foundations; Well Curb, Cutting Edge and Bottom Plug. Also discuss the various methods for rectification of Tilts in the well foundation.
 - e. What is a stability number? What is its utility in the analysis of stability of slopes? Discuss the uses of stability charts.

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**
- Explain how will you modify, the Newmark's equation based on Boussinesq's analysis for vertical pressure below a corner of uniformly loaded rectangular area when the point at which vertical pressure is required is not located below a corner but below some other point of the rectangle.
 - Show the expressions for the Westergaard's solution for the vertical stress due to a point load, for a line load of finite length, due to a rectangularly loaded area and due to a circularly loaded area.
4. Attempt any *one* part of the following: **10 x 1 = 10**
- A rectangular footing has a size of 1.8m x 3m has to transmit the load of a column at a depth of 1.5m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use IS code method. The soil has following properties: Porosity, $n = 40\%$; Specific Gravity, $G = 2.67$; water content, $w = 15\%$; Cohesion, $c = 8 \text{ kN/m}^2$; Angle of shearing resistance $\phi = 32^\circ$; For $\phi = 32^\circ$, $N_c = 36$; $N_q = 23$ and $N_y = 30$.
 - A 30 cm square bearing plate settles by 8mm in the plate load test on cohesionless soil, when the intensity of loading is 180 kN/m^2 . Estimate the settlement of a shallow foundation of 1.6 m square under the same intensity of loading.
5. Attempt any *one* part of the following: **10 x 1 = 10**
- It is proposed to provide pile foundation for a heavy column; the pile group consisting of 4 piles, placed at 2 m center to center, forming a square pattern. The underground soil is clay, having c_u at surface as 60 kN/m^2 and at depth 10m, as 100 kN/m^2 . Compute the allowable column load on the pile cap, if the piles are circular having diameters 0.5 m each and length as 10 m.
 - What are the conditions where a pile foundation is more suitable than a shallow foundation? Discuss different methods for the installation of piles.
6. Attempt any *one* part of the following: **10 x 1 = 10**
- Discuss about the under-reamed piles, and where these piles are to be used? Which method will you use for the design of shallow and deep foundations for the expansive soils?
 - A drilled pier of length 5 m is constructed in an expansive soil having the depth of active zone as 3 m. If the shaft diameter is 1 m and the bulb diameter is 1.25 m, calculate the factor of safety (a) without considering dead load (b) with a dead load of 300 kN on the pier.
7. Attempt any *one* part of the following: **10 x 1 = 10**
- Derive an expression for the factor of safety of an infinite slope in a cohesionless soil. What is the effect of steady seepage parallel to the slope on the stability?
 - In a test block of the size 1.5 m x 1.6 m x 0.75 m, resonance occurs at a frequency of 20 cycles per second in the vertical vibration. Determine the coefficients of elastic uniform compression (C_u) if the mass of oscillator is 70 kg and the force produced by it at 15 cycles per second is 1000 N. Also compute the maximum amplitude at 15 cycles per second