**National Institute of Technology Hamirpur (H.P)**
**Department of Civil Engineering**
**M. Tech (Geotechnical Engineering) First Year**
**I Semester**
**End Term Examination: 2020-21**
**CE–632 Advanced Foundation Engineering**

**Duration: 2 Hours** **Max. Marks: - 50**

**Instructions:**

- Answer all questions
- Missing data, if any, may be assumed suitably.
- Calculator is allowed.
- Students can use relevant Indian Standards.

1. Design an isolated footing subjected to a vertical load of 600 kN rested on layered clayey soil as shown in Fig. 1. [10]

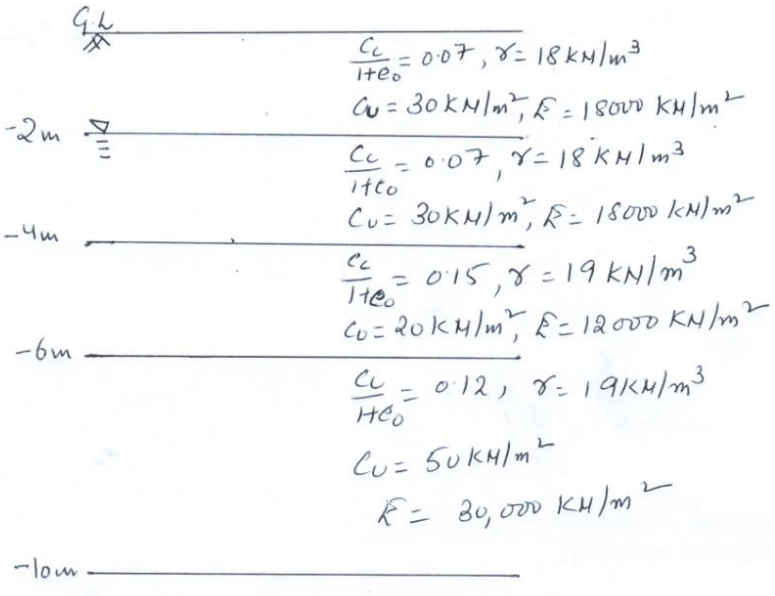



**Fig. 1**

2. A continuous foundation is to be constructed near a slope made of granular soil (See Fig. 2). If B =1.22 m, b= 1.83, H = 4.57 m, Df = 1.22 m, β=30°, ϕ'= 40° and γ =17.29 kN/m$^3$, estimate the ultimate bearing capacity of the foundation. Use Meyerhof's solution. [10]

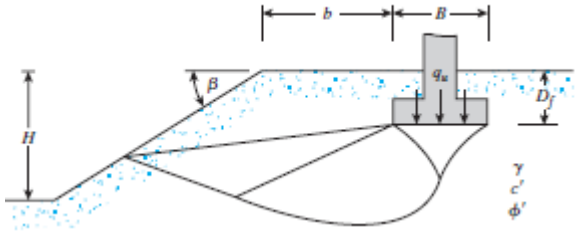



**Fig. 2**

3. A concrete pile 900 mm diameter and 6 m long is installed in a clay soil with cohesion, 1.2 kg/cm$^2$ (N value 12). Estimate the ultimate lateral resistance if the load is applied at a point situated at 4 m above the ground level. Assume $K_1$ = 25.0 MN/m$^3$ and Ec = 26 kN/mm$^2$. If the allowable deflection at ground level is only 25 mm, estimate the load that it can take. [10]

4. Determine the allowable pile load capacity of the 40 cm diameter driven concrete pile as shown in Fig. 3. [10]

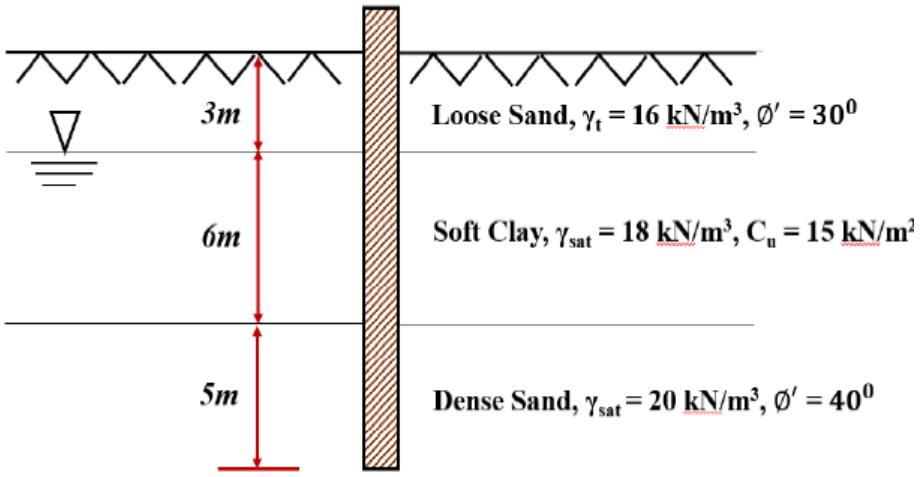



**Fig. 3**

5. The following data refers to a well foundation for a single line railway bridge [10]
   - Net download load on well including self-weight = 1400 t
   - Horizontal force at scour level = 200 t
   - Moment at scour level = 4150 tm
   - Depth of well below scour level = 15 m
   - Saturated unit weight of sand =2.0t/m$^2$.
   - Angle of shear resistance of subsoil = 35$^o$
   - Angle of wall friction =20$^o$
   - External diameter of well = 8.5 m
   - Internal diameter of well =5.5 m
   - Allowable bearing pressure = 55.0 t/m$^2$.

   Check the lateral stability of well using IRC: 45(1972) using Elastic method.

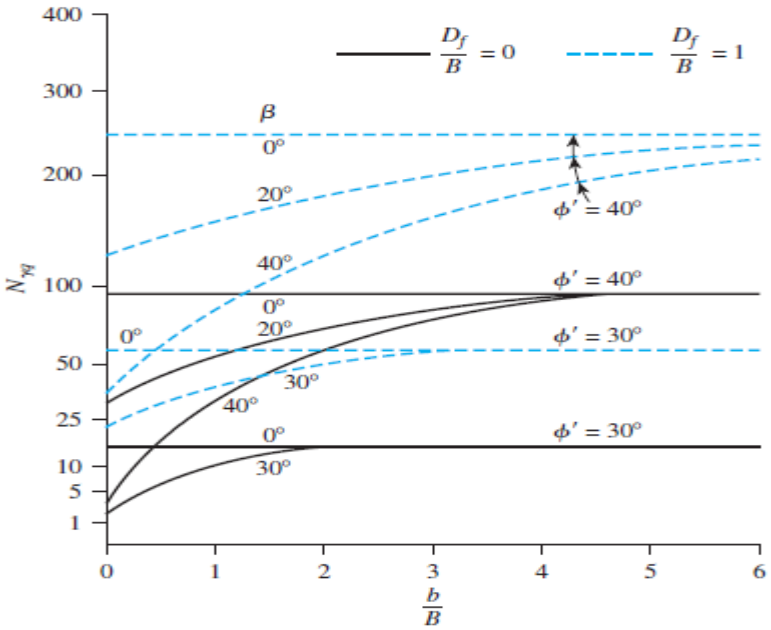
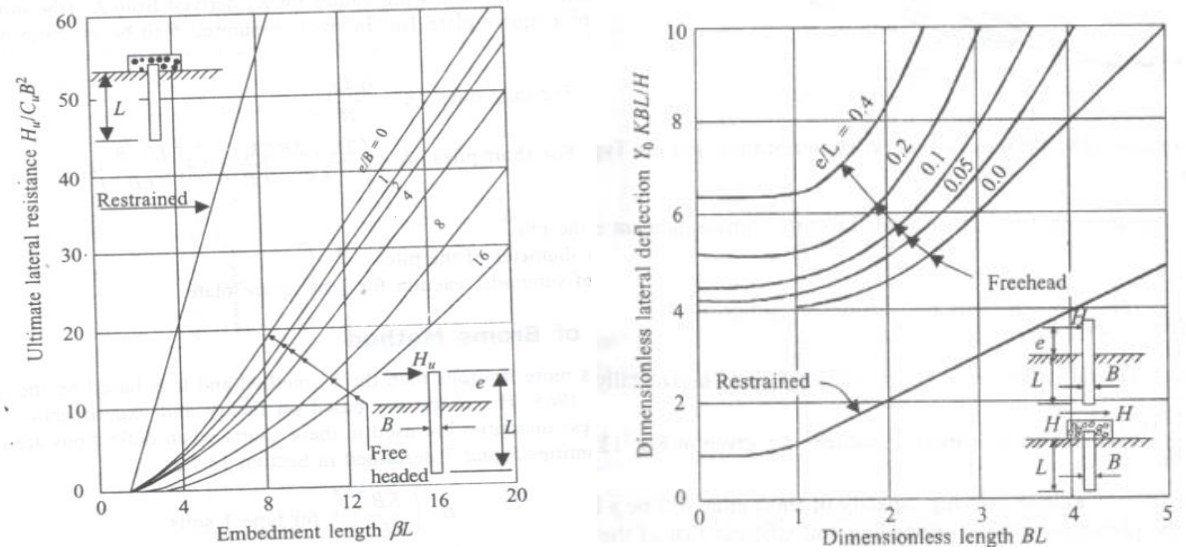



**Fig. 4** Meyerhof's bearing capacity factor for granular soil




**(a)** **(b)**

**Fig. 5** (a) Estimating the ultimate lateral resistance for short piles in clays soil (b) Estimating the lateral deflection at ground level for plies in clay soils under working load.