B. TECH

AFE

ADVANCED FOUNDATION ENGINEERING

B.TECH/7TH/CE

Time: 3hrs

Full Marks: 70

Answer SIX Questions including Question No. 1

The figures in the right hand margin indicate marks

1. (a) What are the basic criteria for the design of machine foundations?
   (b) What is meant by hysteretic damping?
   (c) Explain two factors responsible for swelling character of soil.
   (d) Name various tests for determination of dynamic properties of soil.
   (e) Draw a block foundation and show various possible degrees of freedom.
   (f) Draw the pressure distribution diagram for design of bracings in clays
   (g) A foundation resting on soil and subjected to vertical vibration has a modified mass ratio $B_z = 2.07$. Find out the damping ratio of the system.
   (h) What is differential free swell of soil and how expansive soil is rated based on this parameter?
   (i) Name various factors affecting shrinkage of soil.
   (j) What is floating foundation?

[2× 10]

2. (a) Derive an expression for magnification in a forced vibration system with damping.
   (b) Explain in brief the block vibration test and show how the dynamic properties of the foundation soil system are found from the test.

[5+5]

3. The following data refers to a cyclic plate load test carried out at a depth of 3 m, using 30cm×30cm test plate. Determine Cu, Cτ, Cφ for 10 m^2 area.

Load intensity (kN/m^2)	25	0	50	0	75	0	100	0	150	0	200	0	250	0
Settlement (mm)	0.50	0.40	0.95	0.80	1.60	1.25	2.50	1.90	3.60	2.60	4.80	3.80	6.70	4.90

[10]

4. (a) Explain different types of foundations suitable for expansive soil.
   (b) Define swelling potential. Explain the damages to the buildings due to expansive foundation soil.

[5+5]

5. An 8 m deep braced cut is made in sand having $\gamma = 17$ kN/m^3 and $\varphi = 30^0$. in plan, the struts are placed at 2.0 m center to center. The first strut is placed at 1.4 m from the ground level and the vertical spacing between the struts is 2.2 m. Calculate the strut loading. Determine the section modulus of sheet pile sections required. Use $\sigma_{all} = 170$ MN/m^2.

[10]

6. An anchored sheet pile wall is to retain soil to a height of 5.5 m. The soil including that into which the pile is driven is cohesionless soil with $\varphi = 30^0$ and $\gamma = 20.8$ kN/m^3. The surface of the retained soil is horizontal and level with the top of the well. Determine the minimum penetration depth of the pile to achieve the free earth support. Also, determine the tension in the tie (take depth of the tie rod = 1.0 m from the top of the soil retained.

[10]

7. Write short notes on the following.
   (a) Coffer dam
   (b) Swelling potential
   (c) Radiation damping
   (d) Magnification

[2.5×4]