Total Pages—6

(Set-R_1)

M.Tech - 2nd(CE-GTE)

Stab. Ana. of Slop., Dams and Emb.

Full Marks : 70

Time : 3 hours

Answer any six questions including Q. No. 1

The figures in the right-hand margin indicate marks

1. **Answer the following questions :** 2 × 10

   (*i*) What is toppling ? Where do they occur ?

   (*ii*) Differentiate between sliding and spreading.

   (*iii*) Define area ratio and explain its importance in sampling.

   (*iv*) What is overburden correction in SPT results ?

   (*v*) Determine the maximum safe depth of vertical cut can be made without any support for the soil with $c = 20$ kN/m^2, $\phi = 20^\circ$ and $\gamma = 17$ kN/m^3.

(*Turn Over*)

(*vi*) Differentiate between consolidated drained and consolidated undrained test.

(*vii*) Factor of safety as per 'Swedish method of slices' of a slope of typical c-Φ soil.

(*viii*) Define stability number and explain its use in slope stability analysis.

(*ix*) Explain different methods of slope protection.

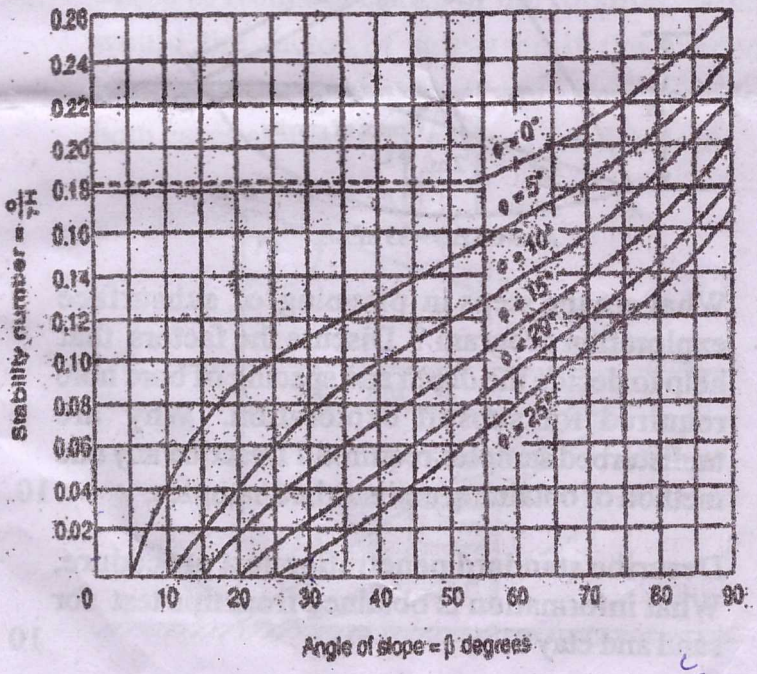
(*x*) What is phreatic surface ?

2. A slope is to be constructed in a soil for which $c = 0.0$ and $\Phi = 36^\circ$. It is assumed that the water level may occasionally reach the surface of a slope with seepage taking place parallel to the slope. Determine the maximum slope angle for a factor of safety of 1·5, assuming a potential failure surface parallel to the slope. What would be the factor of safety of the slope, constructed at this angle if the water table lies well below the sloping surface ? The saturated unit weight of soil is 19 kN/m^3. Derive the relevant formulae. 3 + 3 + 4

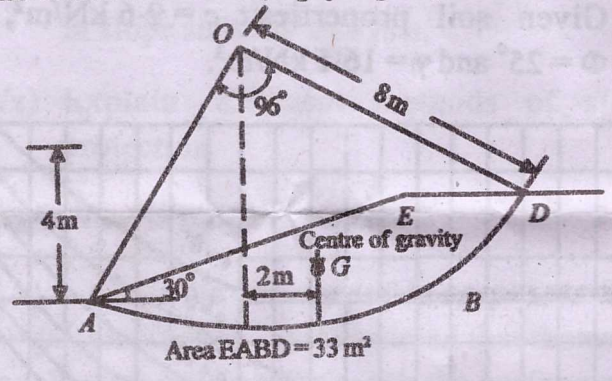
(*Continued*)

3. (*a*) Show with the help of neat sketches different types of circular slope failure. 4

(*b*) Using Taylor's curve [Fig. Q 3(a)] determine the Factor of safety of the embankment slope of height 22·8 m and angle of slope 30°. Given soil properties : $c = 9{\cdot}6$ kN/m², $\Phi = 25°$ and $\gamma = 16{\cdot}1$ kN/m³. 6



4. The cross-section of one of the sides of a canal is shown in the Fig. Q.4. The soil properties are : saturated unit weight $\gamma_{sat} = 20\ kN/m^3$, $c = 25\ kN/m^2$ and $\phi = 0°$. Find the factor of safety for the conditions (*i*) when the canal runs full with the water level at the top of the slope, and (*ii*) when the canal becomes empty rapidly. 10



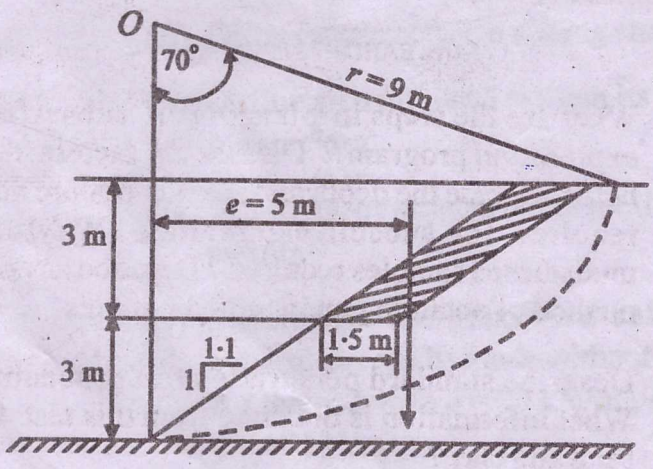
5. What are the steps in planning of subsurface exploration program ? Discuss the factors that help to decide the depth and spacing of bore hole required for subsoil exploration. Why are undisturbed samples required ? Describe any one method of obtaining undisturbed samples. 10

6. Describe standard penetration test procedure. What information is obtained from this test for sand and clay ? 10

(*Continued*)

7. The figure below gives the details of an embankment made of cohesive soil with $\varphi = 0.0$ and $C = 20$ kN/m^2. The unit weight of the soil is 19·0 kN/m^3.

For the trial circle shown, determine the factor of safety against sliding. The weight of the sliding sector is 346 kN acting at an eccentricity of 5·0 m from the centre of the rotation. What would the factor of safety be if the shaded portion of the embankment were removed ? In both cases assume no tension crack develops. 10



8. (*a*) Name different types of landslide. Where do they occur ? 4

(*b*) Discuss on various factors that causes slope failure. 6
