CE 5352 Design of Earth Structures
Assignment 1

Slope stability analysis using planar failure surface

The factor of safety (FS) of a slope with homogenous soil deposit of unit weight γ and shear strength parameters c and ϕ is to be determined (Fig 1) . The slope height is H and the slope inclination with the horizontal is β.

(a) Assuming a planar slip surface passing through the toe of the slope and inclined at angle θ with the horizontal, derive the expression for FS in terms of c, H, ϕ, θ, β and α
(b) For H= 30m, c=10 kPa, ϕ = 30 deg., γ= 18 kN/m^3, β=50 deg., α= 0 deg., find the critical slip plane and the corresponding FS (you may have to use an Excel sheet to get the solution)
(d) For a vertical cut (β=90 deg.) to be made though this soil with c=10 kPa, ϕ = 30 deg., γ= 18 kN/m^3, α= 0 deg., determine the safe depth of cut with a FS = 1.0

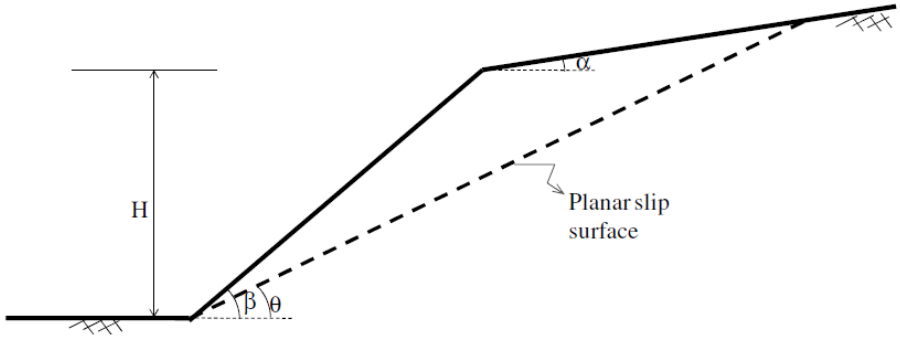

Fig. 1 Definition Sketch