Problems

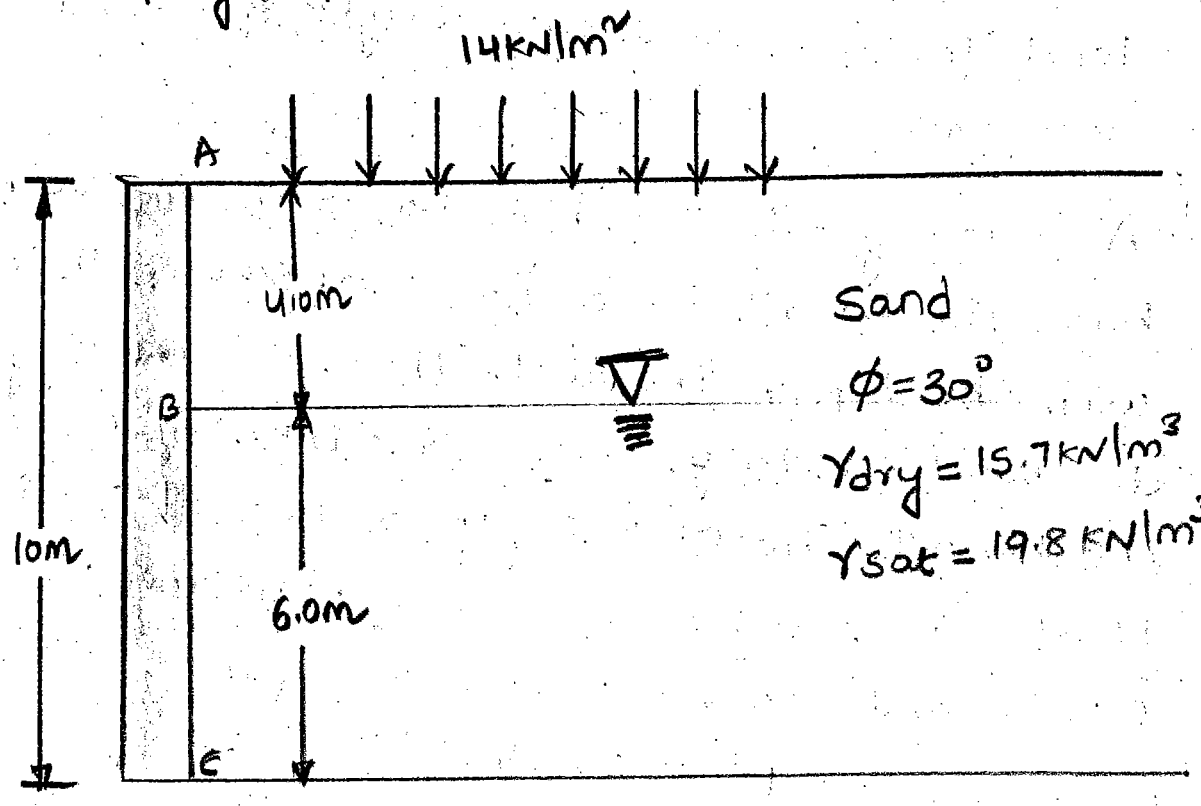
11.3) A retaining wall 10m high retain a cohesionless soil with an angle of internal friction 35°. The surface is level with the top of wall. The unit weight of the top 3m of the fill is 1.6 t/m³ and that of the rest is 2.0 t/m³. Find the magnitude and point of application of resultant active thrust.

11.4) A retaining wall vertical wall 5m high, retaining a sand of unit weight 17kN/m³ for which $\theta = 35°$ the surface of the sand is horizontal and the water table is below the bottom of wall. Determine the percentage change in the active thrust on wall, if water table rises to ground level. The saturated unit weight of sand is 20kN/m³ $\checkmark$. $P = \frac{P_2 - P_1}{P_1} \times 100$

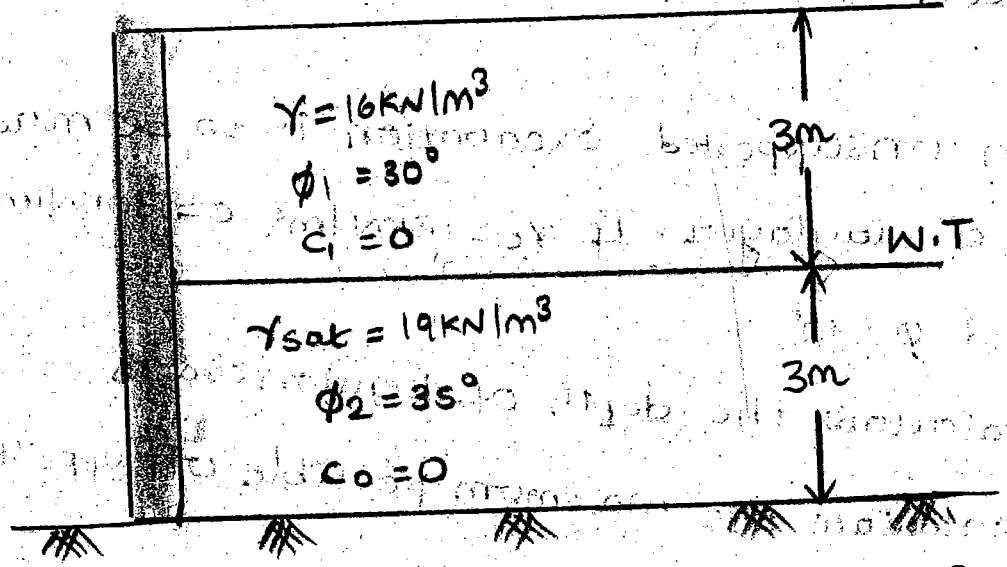
11.5) A retaining wall 10m high, has a smooth vertical back. The backfill has a horizontal surface in level with the top of the wall. There is uniformly distributed surcharge of 63kN/m² intensity over the backfill. The unit weight of backfill soil is 17kN/m³ with angle of shearing resistance, ϕ of 35° and cohesion is zero. Determine the magnitude and point of application of active pressure per meter length of wall

11.6) A retaining wall 6m high supports earth with its face vertical. The earth is cohesionless with particle specific gravity 2.69, angle of internal friction 35° and porosity 40.5%. The surface is horizontal and level with top of the wall. Determine the earth thrust and its line of action on the wall if the earth is water logged to level 2.5m below the top surface. Neglect wall friction. Draw the pressure diagrams.

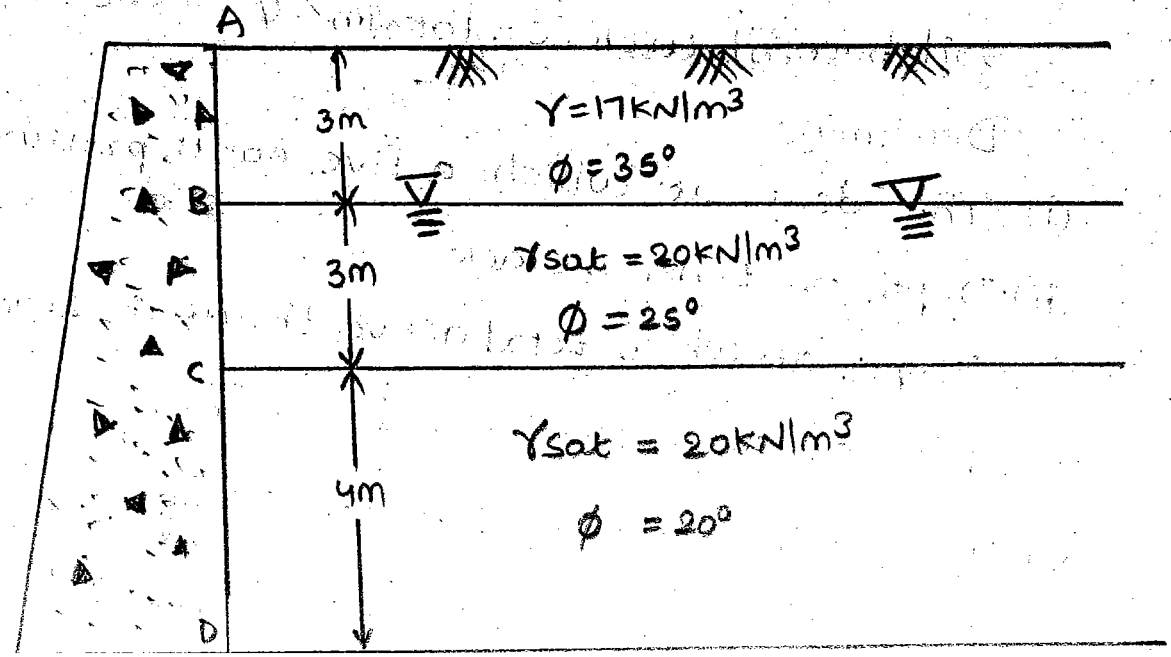
11.7) For an earth retaining wall shown in figure below, sketch the earth pressure diagram active state and find total thrust per unit length of wall and its location.



11.8) For the retaining wall shown in the figure below, assume that the wall can yield sufficiently to develop active state. Use Rankine's active pressure theory and determine (a) active force per meter of the wall and (b) the location of the resultant line of action.



11.9) For the retaining wall shown in figure below plot distribution of passive earth pressure and determine magnitude of total thrust and point of application of the total thrust.



11.10) A soil mass is retained by a smooth incline wall of 6.0m height. The soil has a bulk unit weight of 20 KN/m³ and $\phi = 16°$. The top of soil is level with the top of the wall and is horizontal. If soil surface carries a uniformly distributed load of 4.5 KN/m², determine the total active thrust on the wall per meter of the wall and its point of application

11.11) An unsupported excavation is to be made in a clay layer. If $\gamma_t = 18$ KN/m³, $c = 30$ KN/m², and $\phi = 10°$

(a) Calculate the depth of tension cracks

(b) calculate the maximum possible unsupported depth; and

(c) Draw the active pressure distribution diagram.

11.12) A smooth vertical wall 4m retains cohesive soil backfill with $c = 10$ KN/m², $\phi = 0$ and $\gamma = 18$ KN/m²

Determine

(i) The depth at which active earth pressure is zero

(ii) Depth of tension crack

(iii) Depth at which total active thrust is zero

(iv) plot of active pressure distribution

(v) Total active thrust per unit length of wall when tension cracks not developed

11.13) A 5m high smooth retaining wall with vertical face retains a cohesive backfill having $C = 30 KN/m^2$, $\gamma = 18 KN/m^3$ and $\phi = 20°$, calculate the depth of tension crack and the total active thrust, assuming the tension cracks has fully developed. The backfill surface is horizontal.

11.14) A retaining wall with a smooth vertical back face has to retain a backfill of c-ϕ soil upto 5m above the ground level. The surface of the backfill is horizontal and it has following properties.

$\gamma = 18 KN/m^3$, cohesion $= 15 KN/m^2$, $\phi = 12°$

(a) plot the distribution of the active pressure on the wall

(b) Determine the depth of tension cracks zone.

(c) Determine the magnitude and point of application of the active thrust

(d) Determine the intensity of a fictitious uniform surcharge which is placed over the backfill which can prevent the formation of tension cracks

(e) Compute the resultant active thrust after placing the surcharge.

11.15) A 5m high vertical wall supports a saturated cohesive soil ($\phi = 0$) with horizontal backfill, the top 3m backfill has unit weight of 17 kN/m^3 and cohesion of 15 kN/m^2. The bulk unit weight and cohesion of the lower backfill of 2m is 19.2 kN/m^3 and 22.5 kN/m^2 respectively. If tension cracks developed then what would be the total active thrust on the wall. Also draw the pressure distribution diagram.

11.16) A retaining wall 4m high with a smooth vertical back is pushed against a soil mass having $c = 20$ kN/m^2 and $\phi = 20°$ and $\gamma = 19.2$ kN/m^3 using Rankien's theory compute total pressure and the point of application of resultant thrust, if horizontal soil surface carries a uniform surcharge of 60 kN/m^2

11.1) A 15m high rigid retainingwall with smooth, vertical back retain a mass of moist cohesionless sand with horizontal surface and following Property

$\gamma = 16 kN/m^3$ and $\phi = 32°$

(a) compute the total lateral earth pressure at rest, and its location

(b) If subsequently the water table rises to the ground surface, determine the increase the increase in earth pressure at rest. Take $K_o = 0.45$.

11.2) A cohesionless soil with a void ratio of $e = 0.6$ and specific gravity of soil solids, $G_s = 2.65$ exists at a site where the water table is located at a depth of 2.0m below the ground surface. Assuming a value of coefficient of earth pressure at rest $K_o = 0.5$, calculate total lateral pressure at rest. Assume soil to be dry above the water table and saturated below the water table, Use $\gamma_w = 9.81$.

11.17) A 5m high retaining wall has a granular soil backfill with a level top. The retaining face makes an angle of 85° with the base. Soil Parameters γ, ϕ and δ are 16KN/m^3, 35° & 10° respectively. Calculate active thrust per unit length of wall by using the Coulomb's method.

11.20) A Vertical wall H = 7.5m is having cohesionless soil at the back having γ_{sat} = 22.5KN/m^3, ϕ = 35°. The water table behind the wall is 3.0m below top, The top 3m soil is also saturated due to capillary moisture. Find the total thrust and point of application.

11.21) A retaining wall with a stratified backfill and surcharge load in shown in the following figure. Draw the earth pressure diagram. Also estimate the resultant thrust on the wall & its position.