NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR (H.P.)
DEPARTMENT OF CIVIL ENGINEERING
CED – 313 FOUNDATION ENGINEERING

ASSIGNMENT 2

Q 1. (a) Derive an expression for the active earth pressure behind a retaining wall due to a cohesionless backfill using Rankine's theory for the following conditions:

(i) Dry or moist backfill without surcharge (ii) Submerged backfill

(iii) Backfill with uniform surcharge (iv) Backfill with sloping surface.

(b) Explain active and passive earth pressures. Discuss how will you determine active earth pressure of a cohesive soil?

Q 2. (a) Describe Coulomb's wedge theory for determining the earth pressure behind a retaining wall.

(b) A vertical excavation was made in a clay deposit having unit weight of 20 kN/m^3. It caved in after the depth of excavation reached 4 meters. Calculate the value of Cohesion, assuming ϕ to be zero. If the same clay is used as a backfill against a retaining wall upto a height of 8 m, calculate (i) total active earth pressure (ii) total passive earth pressure. Assume that the wall yields far enough to allow Rankine deformation conditions to establish.

Q 3. (a) Discuss how will you estimate the active earth pressure on a retaining wall by the Culmann's graphical method.

(b) A retaining wall 5 m high has a vertical back and supports cohesive backfill whose surface is level with the top of the wall. The properties of the backfill are:
Angle of friction ϕ = zero, unit weight γ = 18 kN/m^3 and cohesion c = 20 kN/m^2. Determine the magnitude and point of application of the active earth pressure per metre length of the wall considering the effect of development of tension cracks.

Q 4. Explain how will you design a gravity retaining wall.

Q 5. A 6 metres high vertical wall supports saturated, cohesive backfill with horizontal surface. The top 3m of the backfill weighs 18 kN/m^3 and has an apparent cohesion of 18 kN/m^2. The bulk unit weight and apparent cohesion of the bottom 3 m of the backfill are respectively 20 kN/m^3 and 24 kN/m^2. Find the likely depth of tension crack behind the wall? If the tension cracks develop, what will be the total active pressure? Draw pressure distribution diagram and determine point of application of the resultant pressure.

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ASSIGNMENT 3

Q 1. (a) Discuss the forces to be considered in designing a bulkhead.

(b) An anchored bulkhead is to be designed to retain a granular backfill of 9 m height above dredge line. Anchor rod is provided at a depth of 1 m below top of fill. Assuming water table to be 2 m below top of fill and soil of fill as that below dredge line having same properties (c= 0, ϕ =33°, γ=17 kN/m^3 and γ_{sat}=20 kN/m^3); compute the depth of embedment and tensile force in anchor rod of bulkhead. Use free earth support method and increase computed embedment depth by 40%. Also design the anchored bulkhead using fixed earth support method.

Q 2. (a) Explain how will you design the cantilever sheet pile wall in (i) a granular soil and (ii) cohesive soil.

(b) An anchored bulkhead is to be designed to retain a granular backfill of 6 m height above dredge line. Anchor rod is provided at a depth of 1 m below top of fill. Assuming water table to be 3 m below top of fill and soil of fill as that below dredge line having same properties (cohesion c = 0, $\phi = \phi^{\cdot} = 30°$, γ =18kN/m^3 and γ_{sat}=20kN/m^3); compute the depth of embedment and tensile force in anchor rod of bulkhead. Use free earth support method and increase computed embedment depth by one third.

Q 3. (a) Explain free earth support method & fixed earth support method for designing an anchored bulkheads.

(b) Draw the soil pressure diagrams on strutted excavation in sand and clay.