Code No: H8710/R13

M. Tech. II Semester Supplementary Examinations, May-2017

EARTH RETAINING STRUCTURES

(Common to Structural Engineering (87), Soil Mechanics & Foundation Engineering (19) and Geotechnical Engineering (20)

Time: 3 Hours **Max. Marks: 60**

Answer any FIVE Questions
All Questions Carry Equal Marks

1. a What is Coulomb's wedge theory of earth pressure? Derive the conditions for obtaining the maximum active earth pressure.
   b Compute the intensities of active and passive earth pressure at a depth of 8m in dry cohesion less sand with an angle of internal friction 30^0 and unit weight of 18 kN/m^3 . What will be the intensities of active and passive earth pressure if the water level rises to the ground level? Take saturated unit weight of sand as 22kN/m^3 .

2 a With suitable illustration, describe the coulomb's trail wedge method of graphical construction for non cohesive backfill under active earth pressure condition.
   b A masonry retaining wall 6m height is back filled with granular soil having angle of internal friction of 32^0 . The back face (soil face) of the wall is inclined to the vertical at a positive batter angle of 12^0 and the backfill is sloping upward from the top of the wall at a slope of 10:1. Assuming the angle of wall friction as 16^0 , calculate the total active earth pressure on the wall per meter length. The backfill has water content of 16%, degree of saturation of 70% and specific gravity of 2.68.

3 a Classify the retaining walls and discuss the failures of retaining wall.
   b A masonry retaining wall of trapezoidal section has its top width equal to 0.75m and height 6m. Its face which is in contact with the retained earth is vertical. The earth retained is level at top. The soil unit weight is 18 kN/m^3 and its angle of internal friction is 32^0. The masonry weight is 24kN/m^3. Determine the minimum width of the base to avoid tensile stress and determine maximum compressive stress of the base. If the coefficient of friction between base and the soil is 0.70. Check the stability of the retaining wall against sliding.

4. a With suitable illustration, describe the analysis used for finding the depth of embedment of a cantilever sheet pile wall in cohesion less soils and in cohesive soils.
   b An anchored sheet pile is to support a mass of cohesion less soil up to height of 6m above ground level with horizontal anchor toes spaced at 1m intervals and located at 1.0m below the ground surface. If the unit weight of the soil is 21kN/m^3 and its angle of internal friction is 30^0, determine the minimum depth of embedment of the sheet pile for stability.

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5. a Explain the main components of reinforced earth wall.

   b Compute the pullout capacity of the following reinforcement elements buried in a horizontal position at a depth of 8m and having $\gamma = 18kN/m^3$,c =0, $\phi = 30^0$. For soil metal take $\tan\delta = 0.7 \tan\phi$ whereas for soil-grout and soil-geotextile take $\tan\delta = \tan\phi$.
   - i) A steel strip of width 100mm,
   - ii) A driven soil nail of diameter 150mm,
   - iii) A drilled and grouted soil nail in a hole of diameter 150mm, and
   - iv) Unit width of geotextile sheet of length 5m.

6 a What are different types of cellular coffer dams? Discuss their advantages and disadvantages.

   b A vertical cut 2m wide and 3m deep is to be made in clay soil having unit weight $18kN/m^3$ and unconfined strength $40kN/m^2$. Investigate the type of strutting to be used and also examine the factor of safety against base failure.

7. a In circular excavations one rarely uses struts, rakers and tiebacks, where as these are used extensively in rectangular or square shaped excavations. Why?

   b Explain the design of various components of braced cuts.

8. Write short notes on
   - a. Free earth support method
   - b. Mechanics of reinforced earth
   - c. Cummin's Method

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