**B.Constn. Engg. 4th Year Second Semester Exam. 2019**

**Subject: Advanced Foundation Technique**

Time : Three Hours

**Full Marks : 100**

**Answer Q.No.5 and any THREE from the rest**

1. Write a note on foundation on expansive soils. Give in a tabular form potential for volume change vs. plasticity index, shrinkage limit and liquid limit. What is differential free swell? State and explain the preventive measures for foundations on expansive soils.                                                                    25

2. (a) State the design guidelines for stone columns.

   (b) A stone column foundation work is proposed to be conducted for ground improvement work on marine clay deposit for supporting storage tanks of 50m diameter and height 12m. Suggest a suitable scheme for stone column foundation. The subsoil consists of 8m thick silty clay with decomposed wood layer sandwiched between a top dessicated layer and bottom stiff layer. The top dessicated layer extends upto 3m below ground level. The storage tank will be water tested to its full depth and will be placed on 500 mm thick sand layer. Show checks against bearing capacity failure and settlement. Assume $C_u$ value of the top, middle and bottom layer as 3.4, 2.9 and 4.7 $t/m^2$ and unit weights as 1.79, 1.77 and 1.82 $t/m^3$ respectively. Consider $m_v$ value of the middle layer as 0.0065$m^2/t$.                                                            5 + 20

3. (a)    State and explain the basic theory behind the improvement of shear strength by using geotextile. Name the scientist who first proposed the use of geotextile for soil. How do you determine the factor of safety for slope stability using geotextiles?

   (b)    For the embankment shown in Fig. 1 below, determine:
       i) The factor of safety with no geotextile reinforcement
       ii) The factor of safety with seven layers of geotextiles placed at 0.8m interval from the interface of embankment soil and foundation soil towards the top of embankment.
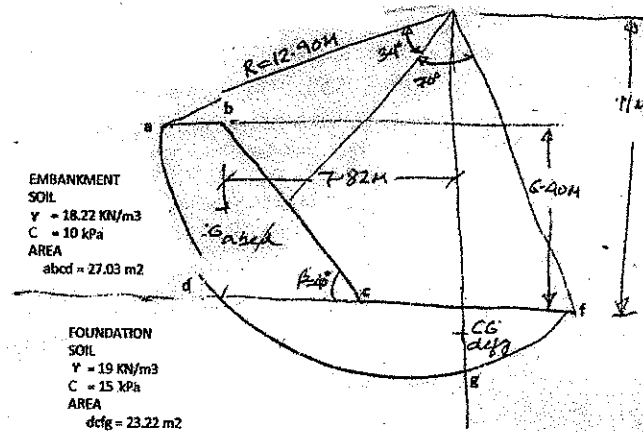   The allowable tensile strength of the geotextile is 22.0 kN/m.

EMBANKMENT
SOIL
Υ = 18.22 KN/m3
C = 10 kPa
AREA
abcd = 27.03 m2

FOUNDATION
SOIL
Υ = 19 KN/m3
C = 15 kPa
AREA
dcfg = 23.22 m2

Figure 1

10+15

4. (a)  What is meant by mechanically reinforced earth walls? Explain with neat sketches giving its salient features.

(b)  Discuss the several factors that influence the design of a reinforced earth wall.

(c)  Analyze the wall of Fig. 2 for using strip reinforcement. The strips will be spaced at s = 1 m and h = 1 m to centre on the concrete wall facing units. Interlocking reinforced concrete facing units will be used as indicated. A wall footing will be poured to provide alignment and to spread the facing unit load somewhat since their weight is more than the unit weight of the soil. A 150 mm thick reinforced cap will be placed on top of the wall to maintain top alignment and appearance. Assume height of the wall to be 9 m. Analyze a typical interior vertical section and select tension strips based on $f_a$ = 140 MPa (strip metal ), $\varphi$ = 34$^0$, $\gamma$ = 17.30 kN/m$^3$, and $\delta$ = 24$^0$. Also check against sliding.

5 + 5 + 15

Figure 2

(Figure labels: $L_s$, Select backfill $\phi = 34°$, $\gamma = 17.30\ kN/m^3$, Facing unit (interlocks not shown), Reinforcement lug, $T_s$, 0.5 m, Wall footing, Original ground)
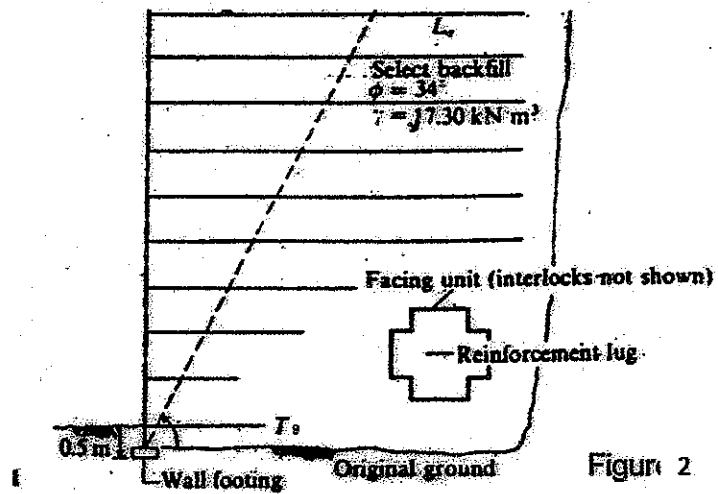
5. Write short notes on any FIVE of the following:      5 x 5

   i)    Meaning of basic assumptions in soil mechanics

   ii)   Retaining wall vs. Reinforced earth wall

   iii)  Soil stabilization

   iv)   Three dimensional consolidation

   v)    Thompson's method for precompression

   vi)   Normal Calcutta deposit and alluvial deposit