

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016**

**Subject Code: 2724303****Date: 31/05/2016****Subject Name: Geosynthetics & Reinforced Earth****Time: 10:30 am to 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Enlist and explain in short different types of geosynthetics. What are the basic favourable characteristics of geosynthetics? (07)
- (b) Explain the concept of reinforced earth wall with neat sketch. How it differs from unreinforced earth? State and explain the limit state principles adopted in RE wall. (07)

- Q.2** (a) What are the functions of geosynthetics? Explain different concepts of basic mechanism of reinforced soil. (07)

- Q.2** (b) Explain the external stability of RE wall as per BS8006. Also show bearing and tilt failure and sliding along the base. (07)

**OR**

- (b) What are the currently used test methods to evaluate the soil geosynthetic interface characteristics? Explain the basic principles of these methods by means of neat sketches. (07)
- Q.3** (a) A geotextile reinforced retaining wall is 6 m high. For the granular backfill, given:  $\gamma_1 = 16.1 \text{ kN/m}^3$  and  $\phi_1 = 33^\circ$ . Given, for the geotextile:  $\sigma_G = 20 \text{ kN/m}$ . For the design of the wall, determine  $S_v$ ,  $L$  and  $l_1$ . Use  $FS_{(B)} = FS_{(P)} = 1.6$ . (07)
- (b) Sketch the various types of reinforced earth walls and various facing panels used in practice. (07)

**OR**

- Q.3** Figure.1 shows section of a retaining wall with geotextile reinforcement. The wall is backfilled with granular soil having  $\phi = 34^\circ$ ,  $\gamma = 18 \text{ kN/m}^3$ . A woven slit-film geotextile with warp direction ultimate wide-width strength of  $50 \text{ kN/m}$  and having  $\delta = 24^\circ$  is intended to be used in its construction. The orientation of the geotextile is perpendicular to the wall face and the edges are to be overlapped to handle the weft direction. A factor of safety of 1.4 is to be used along with site specific reduction factors. Determine (i) spacing of the individual layers of geotextile (ii) length of fabric layers (iii) check for overlap (iv) check for external stability. The backfill carries a uniform surcharge dead load of  $10 \text{ kN/m}^2$ . Assume  $C_r = 0.8$  and  $C_i = 0.75$ . (14)

- Q.4** (a) What is erosion? What are the different forces that cause erosion? Explain erosion control using geosynthetics. (07)
- (b) Write detail note on use of geosynthetics in embankment. (07)

**OR**

- Q.4** (a) What is the purpose and function of a landfill liner system? What are the advantages of geomembranes-clay composite liners? (07)
- (b) Differentiate between transmissivity and permittivity. In laboratory constant head in plane permeability test on a 300mm length (flow direction) by a 200 width geotextile specimen, the following parameters were measured. (07)

-Nominal thickness  $\Delta x = 2 \text{ mm}$

-Flow rate of water in the plane of the geotextile  $Q_p = 52 \text{ cm}^3/\text{min}$

-Head loss in the plane of the geotextile  $\Delta h = 200 \text{ mm}$

Calculate the transmissivity and in plane co-efficient of permeability of the geotextile.

**Q:5 (a)** Using the reduction factors, how can you estimate the allowable functional property of a geosynthetic from the typical laboratory test values for a specific application? (07)

**(b)** Answer in three-four lines with proper reasons/justifications: (07)

(i) In case of soil reinforced element if vertical stress  $\sigma_1$  is increased what change will take place in  $\Delta\sigma_3$  and why?

(ii) What is the disadvantage of metallic reinforcement and why?

(iii) Which type of backfill material should be adopted in case of RE wall and why?

**OR**

**Q:5** Write use and functions of various geosynthetics in water resources project in detail. (14)

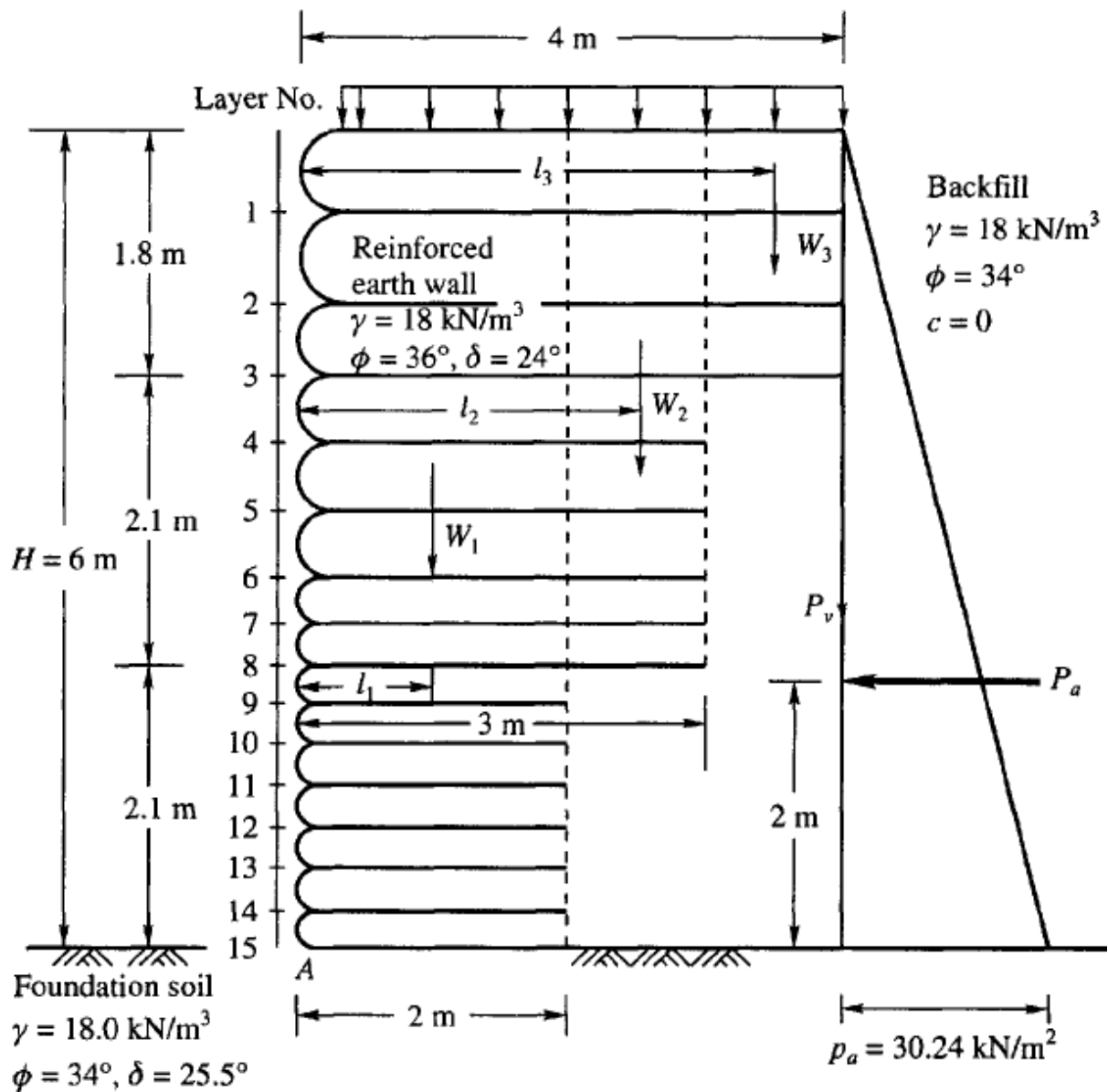


Figure 1