

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME- SEMESTER II- EXAMINATION – SUMMER 2015**

**Subject Code: 2724303****Date: 01/06/2015****Subject Name: Geosynthetics & Reinforced Earth****Time: 2:30 PM – 5:00 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 functions of geosynthetics. Explain the basic mechanisms involved in each function with the help of neat sketches. **07**
- (b)** Enlist the three basic components involved in reinforced earth mechanism. Discuss in detail the various factors evolved in the design of a reinforced earth wall. **07**

- Q.2 (a)** 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.2 (b)** With reference to BS 8006 discuss the importance of partial factors, design loads and design strength for reinforced earth wall. **07**

**OR**

- (b)** What is the importance of reinforcement geometry and reinforcement bond in the mechanism of reinforced earth wall? What role flexible reinforcement plays in design of RE wall? **07**
- Q.3 (a)** A geotextile reinforced retaining wall is 6 m high. For the granular backfill, given:  $\gamma = 16.1 \text{ kN/m}^3$  and  $\phi_1 = 33^\circ$ . Given, for the geotextile:  $G = 20 \text{ kN/m}$ . For the design of the wall, determine  $S_v$ ,  $L$  and  $l_1$ . Use  $FS_{(B)} = FS_{(P)} = 1.6$ . **07**
- (b)** Explain how reinforcement is used to control embankment stability resting on soft soils. State various limit states considered for embankment stability and define with neat sketch rotational stability. **07**

**OR**

- Q.3** A retaining wall of height 6m with geotextile reinforcement is proposed for Ahmedabad ó Mehsana highway. The wall is backfilled with granular soil having  $\phi = 35^\circ$ ,  $\gamma = 17.5 \text{ kN/m}^3$ . A woven slit-film geotextile with warp direction ultimate wide-width strength of 55kN/m and having  $\phi = 25^\circ$  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 1.5 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  $20 \text{ kN/m}^2$ . Assume  $C_r = 0.8$  and  $C_i = 0.75$ . The foundation soil has bulk unit weight of  $18 \text{ kN/m}^3$ ,  $\phi = 36^\circ$ ,  $\gamma = 26^\circ$ . Assume any specific data if necessary, also suggest reinforcement curtailment if you think can economize RE wall cost. **14**

**Q.4 (a)** What do you understand by internal stability? Draw and explain in detail the flow chart of design procedure for reinforced soil walls using anchored earth method with all stability checks. Support your answer with necessary equations. **07**

**Q.4 (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  $\sigma_3$  and why?  
(ii) What is active zone in design of RE wall and which type of length is provided in active zone? Why length is extended to resistant zone?  
(iii) Why polymeric reinforcements are avoided in RE wall?

**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**

**Q.4 (b)** Answer in three-four lines with proper reasons/justifications: **07**  
(i) Due to improper material which type of failures can take place in RE walls and why?  
(ii) What role bond strength plays in case of rigid and flexible reinforcements?  
(iii) Do you think polymeric reinforcement is better as compared to metallic reinforcement, why?  
(iv) Will there be any change in design of RE wall or its behaviour if effective stress analysis is applied instead of total stress analysis? How?

**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)** Discuss the cross-section of a typical flexible pavement. Illustrate how different geosynthetics can be used for improving the performance of these pavements. **07**

**OR**

**Q:5** Write detail note on using geosynthetics in earthdam **14**