Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER II EXAMINATION – SUMMER 2017

Subject Code: 2724303 Date:30/05/2017

Subject Name: Geosynthetics and reinforced Earth

Time:02:30 PM to 05:00 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)**	What do you mean by Geosynthetics and geonaturals? What are the basic favorable characteristics of geosynthetics?	**07**
	(b)	Enlist various functions of geosynthetics. Explain any one in detail with neat sketch.	**07**
Q.2	**(a)**	Explain in brief about raw materials used in production of geosynthetics.	**07**
	(b)	What are the tensile tests performed on geotextile? Explain each in short with suitable test.	**07**
		OR	
	(b)	In a laboratory constant head in-plane permeability test on a 300-mm length (flow direction) by 200-mm width geotextile specimen, the following parameters were measured: Nominal thickness = 2.0 mm , Flow rate of water in the plane of the geotextile Qp = 52 cm^3/min, Head loss in the plane of the geotextile =200 mm Calculate the transmissivity and the in-plane coefficient of permeability (kp) of the geotextile.	**07**
Q.3	**(a)**	Explain how reinforcement is used to control embankment stability resting on soft soils.	**07**
	(b)	List application areas of geosynthetics for filtration and drainage.	**07**
		OR	
Q.3	**(a)**	Write brief note on erosion control	**07**
	(b)	Write brief note on use of geosynthetics in paved and unpaved roads.	**07**
Q.4		A 10 m high retaining wall with galvanized steel strip reinforcement in a granular back fill has to construct. Given: Granular backfill: $\Phi_1' = 36^\circ$,$\gamma_1 = 16.5$ kN/m^3 Foundation soil: $\Phi_2' = 28^\circ$,$\gamma_2 = 17.3$ kN/m^3 , $c_2' = 50$ kN/m^2 Galvanized steel reinforcement: Width of strip = 75 mm , $S_V = 0.6$ m c/c, $S_H = 1$ m c/c, $f_y = 24000$ kN/m^2 ,$\Phi_\mu = 20^\circ$, $FS_{(B)} = 3$, $FS_{(P)} = 3$ Check the internal and external stability. Assume corrosion rate for strip 0.025mm/year and life span of structure is 50 years.	**14**
		OR	

Q.4 Design a 2.0 m wide strip footing carrying 1000kN/m load, which is placed at 1.0 depth. **14**

Soil properties: γ_b= 17 kN/m^3, Φ= 33° [N_q=26.09 & N_γ=26.17],
Es = 3.5 x10^4 kN/m^2,μ = 0.28. Take FS =3[against shear failure for unreinforced foundation]. Permissible settlement = 25 mm.
Tie detail: width w = 80 mm, f_y = 2.5x10^5 kN/m^2, soil-tie interface friction angle Φ_μ=25°, FS$_{(B)}$= 3 , FS$_{(P)}$= 2, LDR=w.n=60%, N =5
u=0.5m = Distance of 1st layer of reinforcement from bottom of the foundation
h=0.5m= Distance between each layer of reinforcement.
Use following table and relationship:

Layer No.	z (m)	z/B	α	β	δ	X/B	x′/B
1	0.5	0.25	0.35	0.38	0.11	0.98	0.60
2	1.0	0.5	0.33	0.36	0.12	1.40	0.70
3	1.5	0.75	0.31	0.31	0.125	1.75	0.85
4	2.0	1.00	0.30	0.27	0.13	1.85	0.90
5	2.5	1.25	0.29	0.21	0.14	2.30	1.05

Tie force/m at depth z

$$T = \frac{1}{N}\left[q_o\left(\frac{q_R}{q_o} - 1\right)(\alpha B - \beta h)\right]$$

Frictional resistance against pullout at depth z

$$F_p = 2\tan\phi_\mu(\text{LDR})\left[\delta B q_o\left(\frac{q_R}{q_o}\right) + \gamma(X - x')(z + D_f)\right]$$

Q.5 **(a)** A geotextile reinforce retaining wall is 5 m high. For the granular back fill Φ_1 = 36°,γ_1= 15.7 kN/m^3. For geotextile T_{ult} = 52.5 kN/m. For the design of wall determine S_V, L *and* l_l. Use RF_{id} = 1.2 , RF_{cr} = 2.5, RF_{cbd}= 1.25 **07**

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

OR

Q.5 **(a)** How does an engineering landfill differ from an open dump of wastes? Write note on use of various geosynthetics in landfills. **07**

(b) Answer the following questions. **07**

(i) Which parameters govern internal stability of reinforced soil?
(ii) Define the failure criteria of reinforced soil wall.
(iii) What are limitations of a flexible reinforcement element?