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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

END SEMESTER EXAMINATION-2015

B.Tech VIII Semester

COURSE CODE: 14B1WCE831 MAX. MARKS: 45

COURSE NAME: GEOTEXTILES

COURSE CREDITS: 3 MAX. TIME: 3 HRS

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume necessary data wherever required.

Section A [9 marks]

1. Incase of geotextiles placed on soil subgrades beneath stone base courses for highways, when does the geotextile act as a separator vis-a-vis reinforcement? [2]
2. A stone aggregate has been placed around a highway underdrain with a geotextile.
   a) What is the major function of the geotextile?
   b) If properly designed, what should be the long term condition of the stone base?
   c) If the stone base has sufficient open space to transmit the entering water, of what necessity is the perforated pipe?
   d) What is a French drain?

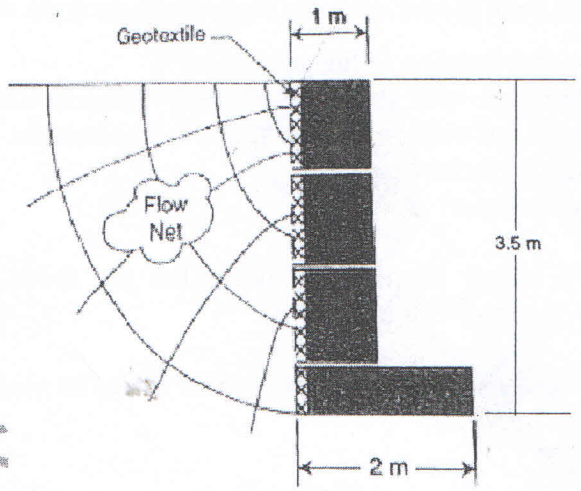
   [1 + 1 + 1+ 1 = 4]
3. While geotextile silt fences function as filters, but the focus is mainly on strength considerations. Why is strength so important? [2]
4. In geotextile testing, how can typical laboratory-test values be made into allowable values for design-by-function procedure? [1]

Section B [13.5 marks]

1. With the help of a diagram, derive the two set of equations used for calculating the thickness of stone base (Δh) in an unpaved road with and without geotextile. [3.5]
2. What energy is mobilized by a free falling rock of 300mm size falling 1.5m onto a geotextile? The geotextile is supported by poor subsoil having an unsoaked CBR strength of 4.0. If the geotextile has allowable impact strength of 36J, what is the factor of safety? Take modification factor for subgrade condition = 13. [5]
3. Derive all the expressions for internal and external stability involved in the design of MSE walls with the help of a diagram. Plot the pressure distribution also. [5]

Section C [22.5 marks]

1. Given a cover soil slope of $\beta = 18.4°$ (i.e. 3H : 1V), L = 30m, H = 900mm, $\Upsilon = 18$ kN/m^3, c = 0, $\phi = 30°$, $C_a = 0$, $\delta = 18°$, determine the resulting factor of safety. **[8]**
2. Design a 6m high wrap around type geotextile wall for **internal stability only** that is to carry a storage area of equivalent dead load of 10 kPa. The wall is to be backfilled with a granular soil (SP) having properties of $\gamma = 18$ kN/m^3, c = 0 and $\phi = 36°$. A woven slit – film geotextile with tensile strength of 50 kN/m and friction angle with granular soil of $\delta = 24°$ is intended to be used in its construction. A factor of safety of 1.4 is used along with site specific reduction factor of 3.78. Optimize the design by taking different spacing of the geotextile along the wall height. **[8.5]**
3. Given a 3.5 m high gabion wall consisting of three 1 x 1 x 3m long baskets sitting on 0.5 x 2 x 3m long mattresses as shown in the diagram below:



The backfill soil is a medium-dense silty sand of $d_{10} = 0.03$mm, $C_u = 2.5$, k = 0.0075 m/s and $d_{85} = 0.15$mm. Check the adequacy of three candidate geotextiles whose laboratory test properties are given in the table. Use cumulative reduction factor of 15.0. **[6]**

Geotextile		Permittivity (sec^{-1})	AOS (mm)
No.	Type		
1.	Non – woven needle punched	2.0	0.30
2.	Woven monofilament	1.2	0.42
3.	Non-woven heat bonded	0.4	0.21