UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	GEOSYNTHETICS DESIGN
COURSE CODE	:	BFG40403
PROGRAMMECODE	:	BFF
EXAMINATION DATE	:	JULY 2020
DURATION	:	6 HOURS
INSTRUCTION	:	ANSWER **ALL**QUESTIONS

THIS QUESTION PAPER CONSISTS **THREE (3)** PAGES

Q1 (a) A geotextile is similar to a soil in that it has void (pores) and particles (filament and fibers). However, because of the shape and arrangement of the filaments and the compressibility of the structure with geotextiles, the geometric relationships between filaments and voids is more complex than in soils. Based on this concepts and analogies, determine **THREE (3)**criteria state to design geotextiles filter for civil engineering purposes.

(10 marks)

(b) B is a function of uniformity coefficient (C_u) for retention criteria in steady state flow conditions. Determine the equation of B as follows;

(i) $C_u \leq 2$ or ≥ 8

(2 marks)

(ii) $2 \leq C_u \leq 4$

(2 marks)

(iii) $4 < C_u < 8$

(2 marks)

(c) Explain in details the retention criteria for dynamic flow conditions and state **ONE (1)** example in civil engineering application.

(9 marks)

Q2 (a) Determine **TWO (2)** requirements to design the permeability criteria for actual flow capacity through geotextile.

(6 marks)

(b) For paved and unpaved road applications where geotextile separation is the dominant function. Describe **TWO (2)** key criteria governing the selection and properties of geotextile.

(6 marks)

(c) Filtration and drainage are the functions of geosynthetic. It can perform both drainage and filtration. Describe these **TWO (2)**functions and how they are different.

(7 marks)

(d) List out the differences between the permittivity and transmittivity in geosynthetic design.

(6 marks)

Q3 (a) Design a 6 m high geogrid-reinforced retaining structure using a grid with an ultimate tensile strength of 144 kN/m and strength at 5% strain = 62 kN/m. Overall FS should be 1.4. Partial FS's for the grids should be 4 (ultimate tensile failure) and 2 (excessive deformation at 5% strain). Assume free-draining backfill with γ=18.5 kN/m3 and Φ'=32°. The structure needs to be essentially vertical ($\beta \geq 85°$).

Calculate allowable reinforcement strength and determine the necessary values from the appropriate design chart. Since the backfill is assumed to be free-draining, $u \approx 0$.

(8 marks)

(b) Calculate the vertical spacing, SV required near the base where the stresses are greatest and propose the best and ideal reinforcement length.

(7 marks)

(c) If you choose the strongest reinforcing that is readily available, propose the best slope angle if you have to flatten the slope.

(5 marks)

(d) If you had to keep the slope vertical, suggest the strength reinforcing you would need.

(5 marks)

Q4 (a) Explain in details the role of geosynthetics to design an embankment on soft soil.

(7 marks)

(b) Define the prefabricated vertical drain (PVD) and smear zone effect during installation of PVD.

(8 marks)

(c) Discuss on how to prevent the excessive vertical and horizontal deformation of embankment on soft soil. Explain in details their design steps.

(10 marks)

- END OF QUESTIONS –