



5 questions in two pages

مسموح باستخدام جداول الطرق

Question 1 (20 marks)

- 1- Discuss the origin and formation of soils? Illustrating the weathering reasons?
- 2- Explain the purposes of soil compaction? Illustrating with drawing suitable curves the factors affecting on compaction?
- 3- How the soil strength can be measured? Discussing the factors that affect on the results of each test used to measure the soil strength?
- 4- Compare between the methods and equipments used to determine the soil density in the field and the laboratory?

Question 2 (20 marks)

Soil No 1

Sieve No.	10 (2 mm)	40 (0.425)	100 (0.15)	200 (0.075)	270 (0.055)	L.L	P.L
% passing	100	98	90	80	60	45	23

Soil No 2

Sieve No.	4 (4.75mm)	10	40	60 (0.27)	100	200	270	L.L	P.L
% passing	60	56	30	19	13	10	5	22	19

1. Classify the previous two soils according to AASHTO, Unified system and FAA classifications? And describe each soil?
2. Discuss the probable behavior of each soil as a subgrade ?
3. Determine the suitable compactor type for each soil?
4. If the soil number 1 in the previous question used as a subgrade soil. assuming this subgrade exists at a depth of 6 feet in a cut section of a road , the ground water table is at 1 feet below the surface , its required to:
 - propose and sketch the type of sub drainage system.
 - give the grain size distribution limits of filter material around the pipes.
 - discuss if soil number 2 can be used as a filter or not ?

Question 3 (20 marks)

- 1- define the term of "Geosynthetics" illustrating its application areas in highways?
- 2- A 30 inch plate loading test was performed on a subgrade soil and on a 12 inch base course. This test yielded the following results:

Deflection (in)	0.01	0.03	0.05	0.06	0.8	0.18
Load on subgrade (Ib)	3532	8100	11330	12010	13423	14130
Load on base (Ib)	5652	12717	17668	20335	24727	28260

- Determine the modulus of subgrade reaction of subgrade soil and the base course

3- The following data taken during a CBR test for base soil,

Penetration. (in)	0.025	0.05	0.075	0.1	0.15	0.20	0.30	0.40	0.50
Load (Ib)	36	51	90	240	600	900	1250	1350	1400

- Determine CBR value for this soil.
- Determine the surcharge weight required for the above CBR test where the estimating pavement thickness will be 18 inch and the pavement will have a unit weight of 140 Ib/ft³.

Question 4 (20 marks)

- 1- A wet soil sample weights 40 gm , After oven drying the weight is reduced to 29 gm , determine the moisture content . If the degree of saturation of the sample is 80% and its specific gravity is 2.7, determine the porosity, the void ratio, the bulk density and dry density.
- 2- A cohesion less soil has a degree of saturation of 45% when it is in natural state. The saturated density of the soil is 1.95 t/m³ and the dry density is 1.62 t/m³. Determine the bulk density of this soil at the natural state. Also determine the moisture content.
- 3- In the field a sand cone test was performed in compacted soil. the results of sand cone test were as follow:-

Weight of excavated soil ----- 20 Ibs.
Weight of sand before performing the test ----- 57 Ibs.
Weight of sand after performing the test ----- 25 Ibs.
Weight of sand that fill the cone ----- 18 Ibs.
Unit weight of calibrated sand ----- 97.3 Pcf.
Oven-dry weight of excavated soil ---- 15.5 Ibs.

- a) Determine the max dry density
- b) Discuss the relative compaction if the laboratory dry density was 121.2 Ib/ft³.
- c) Calculate the saturated moisture content if specific gravity was 2.6

Question 5 (20 marks)

- 1- Compare between: Mechanical & Chemical stabilization?
- 2- Talk in details about bituminous stabilization?
- 3- What is the difference between cement stabilization of sand soil and gravel mixtures?
- 4- What are the main functions of lime in lime stabilization? Illustrating the reactions between lime-soil mixtures?
- 5- A soil sample of 22% water content was taken from a field after compaction. The weight of the specimen in air =1220 gm , its weight in air and water after coating with paraffin is 1268 , 700 gm respectively , GS of paraffin = 0.9 , maximum dry density in laboratory = 140 pcf , determine the relative compaction .

*With my best wishes
Dr. Ahmed Abu El-Maaty*