**CE 34500: Transportation Engineering**

**Homework 7**

**Due: Monday, April 27, 2020**

**Problem 1:** A moist soil has a moisture content of 12.5%, weights 43.2 Ib, and occupies a volume of 0.35 ft3. The specific gravity of the soil particles is 2.6. Find:

1. bulk density
2. dry density
3. void ratio
4. porosity
5. degree of saturation
6. volume occupied by water

**Problem 2:** The following results were obtained by a mechanical analysis. Classify the soil using the AASHTO classification system and give the group index.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sieve analysis, % finer | | | LL | PL |
| No. 10 | No. 40 | No. 200 |
| 98 | 81 | 38 | 42 | 23 |

**Problem 3:** The table shows results obtained from a standard AASHTO compaction test on six dry samples, 4 in. diameter, of a soil to be used as fill for a highway. Determine the maximum dry density and the optimum moisture content of the soil.

|  |  |  |
| --- | --- | --- |
| Sample no | Weight compacted  soil, W (Ib) | Moisture Content,  w (%) |
| 1 | 4.16 | 4 |
| 2 | 4.39 | 6.1 |
| 3 | 4.5 | 7.8 |
| 4 | 4.68 | 10.1 |
| 5 | 4.57 | 12.1 |
| 6 | 4.47 | 14.0 |

**Problem 4:** Interstate Highway (4 lanes both direction) with AADT of 6000 (90% car, 10% truck) in one direction takes a week for water to be drained from pavement and pavement will be exposed to moisture levels approaching saturation for 30% of the time. Consider design life as 20 years and traffic growth 4%.

Resilient modulus of asphalt concrete at 68°F = 450,000 lb/in2

CBR base = 100, Mr = 31,000 lb/in2

CBR subbase = 22, Mr = 13,500 lb/in2

CBR of subgrade = 6

Determine suitable pavement structure. Use the tables from your book or handouts.