CE 34500: Transportation Engineering
Spring 2020
Homework 1

1. The design speed of a multilane highway is 60mph. Determine a) the minimum stopping sight distance that should be provided for a level roadway, and b) the minimum stopping sight distance that should be provided for a roadway with a maximum grade of 5%. Note: the term $\frac{a}{g}$ in the appropriate equation is typically rounded to 0.35 in calculations. Assume perception reaction time = 3.0 sec.

2. The acceleration of a vehicle can be expressed as:

$$\frac{du}{dt} = 3.6 - 0.06u$$

   If the vehicle speed, u, is 30 ft/sec at time T_0, determine:
   a. Distance traveled when the vehicle has accelerated to 45 ft/sec.
   b. Time for vehicle to attain the speed of 50 ft/sec.

3. Determine the horsepower developed by a passenger car travelling at a speed of 50 mph on an upgrade of 4% with a smooth pavement. The weight of the car is 4000Ib and the cross-section area of the car is 40 ft^2.

4. Determine the minimum radius of a horizontal curve required for a highway if the design speed is 70 mph and the super-elevation rate is 0.08.

5. A curve of radius 250 ft. and $e = 0.08$ is located at a section of an existing rural highway, which restricts the safe speed at this section of the highway to 50% of the design speed. This drastic reduction of safe speed resulted in a high crash rate at this section. To reduce the crash rate, a new alignment is to be designed with a horizontal curve. Determine the minimum radius of this curve if the safe speed should be increased to the design speed of the highway. Assume $f_s = 0.17$ for the existing curve and the new curve is to be designed with $e = 0.08$.