

ECE 398GG Electric Vehicles
Quiz 1 Spring 2022
TIME 20 minutes

Prof. G. Gross

NAME:

last 4 digits of the UIN:

Problem 1: 120 points

We consider an *EV* with a 40-kWh battery pack, a 90-% efficiency drivetrain and a 1-kW hotel load. The total car mass is 1,800 kg including the driver's weight. The manufacturer data specify that $C_d = 0.28$ and the frontal area is 2.28 m^2 . The *EV* is used to travel on a flat, Midwestern highway. The driver is instructed to ensure that the battery charge does not drop below the 20 % level. The power requirements to provide the needed traction force under the conditions stated above are determined and are presented below for three distinct cruising speeds:

speed in <i>mph</i>	required traction power in <i>kW</i>
45	3.67
70	16.10
75	40.50

The driver must reach the destination without a charging stop and he knows he can do so at the 45 *mph* cruising speed. **Determine** the ratio of the range the driver can attain with respect to the range at 45 *mph* at the two higher speeds. **State** and **justify** any assumptions you wish to make. **Show** all your work.

Problem 2: 80 points

For the statements below, circle each correct statement. We discourage guesses and it helps if you provide a justification of why you chose to circle or not circle the statement.

A. The 2020 *US* electricity generation had

- about 40 % from CO_2 -free source
- about 60 % from fossil fuel as the primary energy source
- hydroelectric generation as the largest source of renewable energy
- solar energy provided nearly 4 times as much energy as that provided by wind

B. The following statements are on the *US GHG* emissions expressed in *metric tons CO_2e* :

- the transportation sector *GHG* emissions exceed those from the electricity sector since 2013
- the estimated 2021 *GHG* emissions indicate an increase over the actual 2020 value
- during the 2019 – 2021 period, the *GHG* emissions from buildings were about equal to those from the electric power sector
- the estimated 2021 *GHG* emissions indicate an increase over the actual 2019 value