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Bourns College of Engineering, Center for Environmental Research and Technology
University of California, Riverside

Sustainable Transportation & Automated Vehicle Learning Module Homework

- 1) Which of these is **not** a major transportation issue that we are trying to solve:
 - ☐ roadway safety
 - ☐ mobility (efficiency, throughput, congestion)
 - ☐ rapid tire deflation
 - ☐ economics of travel
 - ☐ air quality
 - ☐ climate change
- 2) In general, surface transportation has gotten safer (per vehicle miles traveled (VMT)) mainly due to:
 - ☐ Better roadway infrastructure
 - ☐ People are much better drivers
 - ☐ On-board vehicle safety technology
 - ☐ Extensive driver training around the world
 - ☐ None of the above
- 3) What is the main reason that air quality has improved tremendously since the 1990's:
 - ☐ Switching to unleaded fuel
 - ☐ Catalytic converter-based emission control systems
 - ☐ Strict stationary source emission controls
 - ☐ Limiting truck traffic on our roads
 - ☐ Removing volatile organic compounds (VOCs) from our paints
- 4) In California, transportation accounts for X% of CO₂ emissions:
 - ☐ 10%
 - ☐ 20%
 - ☐ 30%
 - ☐ 40%
 - ☐ 60%
- 5) Which transportation characteristic have we made the least amount of progress in terms of reducing GHG?
 - ☐ The conversion from internal combustion vehicles to battery vehicles in California
 - ☐ Reducing total vehicle miles traveled (VMT)
 - ☐ Improving the overall vehicle fleet efficiency
 - ☐ The introduction of intelligent transportation system technology
- 6) Automated Vehicles and Autonomous Vehicles are considered to be different because:
 - ☐ They are not different, they are the same thing
 - ☐ Automated vehicles are driver by humanoid robots, and autonomous vehicles drive by themselves

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- Autonomous vehicles come from the 5 autonomous regions of China (Guangxi, Inner Mongolia, Ningxia, Tibet (Xizang) and Xinjiang), and automated vehicles are produced in the U.S.
 - Autonomous vehicles rely on their own sensors to self-drive and automated vehicles rely on sensors and communication with other vehicles
- 7) How will vehicle automation most likely affect “mobility” negatively?
- It will require specialized lanes, thereby decreasing capacity
 - people will find it easier to drive, therefore increasing demand, creating more congestion
 - it will incentivize people to live farther away from work/school
- 8) Automated vehicles could have a major negative effect on GHG emissions due to:
- the need to recycle batteries often
 - the extra consumption of energy to power all of the sensors and control systems
 - people will likely increase the amount of driving they do because of the convenience
 - there will be many more automated vehicle accidents that will cause a lot more congestion
- 9) Connected and Automated vehicles can reduce GHG emissions by:
- Allowing vehicles to drive faster
 - Increasing the overall density of traffic
 - Smoothing traffic flow through coordinated maneuvers
 - Allowing quick safe lane changes at freeway speeds
- 10) Partial automation can help reduce GHG emissions by:
- Predictive powertrain control on vehicles
 - Controlling vehicle dynamics for smoother driving
 - Allowing traffic signal controllers to anticipate vehicle platoons
 - All of the above
- 11) Drivers that have hearing problems can have X times more accidents than do drivers with normal hearing:
- Zero (there is no difference)
 - 5
 - 1.8
 - 22
- 12) If your current speed is 75 mph and you set your ACC target (desired) speed to 65 mph, what acceleration will be requested by the ACC system? Assume there is no vehicle ahead.
- a. -2 m/s^2
 - b. -1.8 m/s^2
 - c. -1.2 m/s^2
 - d. -0.5 m/s^2
- 13) Now, a vehicle changes lanes in front of you. It is 60 m away (measured from your front bumper to their rear bumper) and is traveling at 55 mph. If your desired time gap is 1 second, what acceleration will be requested by the ACC system?
- a. -2.3 m/s^2
 - b. -2 m/s^2

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- c. -1.8 m/s^2
- d. 0
- e. 1.3 m/s^2

14) In the situation above, what is the time to collision? (Round to the nearest whole number.)

- a. 4 s
- b. 5 s
- c. 6 s
- d. 7 s

15) Driving at which of these speeds will yield the worst fuel economy?

- a. 10 mph
- b. 20 mph
- c. 40 mph
- d. 60 mph

BONUS:

The following questions are based on information which can be found at <https://www.cert.ucr.edu/transportation-systems-vehicle-infrastructure-interaction>. You will have to click on the Research Focus Areas to find the answers.

16) What are the anticipated fuel savings of CE-CERT's "eco-approach and departure" algorithm?

- a. 10%
- b. 18%
- c. 44%
- d. 100%

17) In Los Angeles, what percentage of the population lives within 50-100 meters of major roads?

- a. 10%
- b. 20%
- c. 30%
- d. More than 30%

18) When was the Comprehensive Modal Emissions Model (CMEM) developed? (Hint: look under "Innovative Vehicle Evaluation Techniques")

- a. 1980's
- b. 1990's
- c. 2000's
- d. 2010's

19) On which street is Riverside's proposed Innovation District located?

- a. University
- b. Magnolia
- c. Central
- d. Arlington

20) Which sensor is NOT used by the vehicles in the Smart City Laboratory?

- a. 1D LiDAR

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- b. Fisheye camera
- c. Radar