AUTONOMOUS DRIVING

POSSIBLE ANSWERS

1. **Give three examples of sophisticated computerised systems already present in modern cars!**

   Even basic vehicles have at least 30 microprocessor-controlled devices, also called electronic control units; luxury cars have as many as 100 or more. Some are

   1. ABS (Anti-lock braking systems) reading the wheel speed and controlling the brakes

   2. Navigation systems Cruise control Lane control systems

   3. Any radio or media player with a digital display contains a computer of its own

   4. Keyless entry/access park assist/self-parking Air Bag Systems sensors

      Further:

      Electronic throttle control: Throttle-by-wire technology replaced cables or mechanical connections. In modern systems, when the driver pushes on the accelerator, a sensor in the pedal sends a signal to a control unit, which analyses several factors (including engine and vehicle speed) and then relays a command to the throttle body. Among other things, throttle-by-wire makes it easier for carmakers to add advanced cruise and traction control features. These systems are engineered to protect against the kind of false signals or electronic interference that could cause sudden acceleration.

      More sensors that could be mentioned:

- The oxygen sensor
- The air pressure sensor
- The air temperature sensor
- The engine temperature sensor
- The throttle position sensor
- The knock sensor (sensing vibrations)/active collision advance (camera or sensor)

2. **Why are autonomous cars "another matter entirely" compared to cars with computerised systems assistance?**

   Autonomous cars really do drive *themselves*. Maybe there is not even a steering wheel in such vehicle. In addition, the question of liability in the case of an accident is also completely different since there is no active driver at all.

3. **Defining the "trolley problem":**

   The trolley problem as an ethical thought experiment and illustrates the moral dilemma of what to do in the case of an impending accident. If a vehicle is about to have a collision in which multiple people could potentially be killed, should the vehicle divert away from the group of people saving their lives but still hitting someone else and definitely killing him/her instead? There are many variations on different aspects of the trolley problem in philosophical debate. The question in autonomous vehicles is clearly who decides how the vehicle will proceed?

4. **What would a utilitarian position solving the "trolley problem" look like?**

   Is it ethical to kill one to save more lives for the greater good? Utilitarianism is one school of thought having an answer. Utilitarians believe in such quantifiable approaches: one by-stander could be sacrificed in order to save more of those who were directly involved to begin with rather than doing nothing as passivity would be immoral. Something needs to be done and five lives are worth more than one.

5. **Kantians would take yet another programming approach to the "trolley problem". What would it be?**

   Kantianism is classified as normative ethics based on rules about right and wrong, less on what consequences of any actions might be. In the eyes of Kant and his followers, it is not acceptable to actively kill innocent people and the means doesn't justify the end, i.e. you can't sacrifice one life to save a greater number of lives, because that will constitute unethical behaviour because human lives are considered *incommensurable*[1].

6. **What did early simulations involving a large box and a child dummy show?**

   The vehicle hits the child not the box, the decision being based on size: Bigger = greater danger to the vehicle. Meantime cars are engineered with "defensive programming" to counter erroneous signals. There is an engineering effort, testing and validation, to guard against such problems.

7. **Why is the demand to return vehicle control to the human driver in an accident rather unwise?**

   People are at their worst in stressful situations and are more likely to react irrationally and ineffectively – too much information at once = panic = bad! Even though most people think that they would react better than a machine in such a situation the evidence suggests that in fact the opposite is true.

[1] Two values are incommensurable in ethical considerations when there cannot be a "trade-off" against one another as both values are incomparable.

8. **If it became culturally the acceptable norm that humans should be rational only, what could this possibly imply?**

   It could mean that humans would become less emotional and far more predictable and therefore less diverse. There is also the question of the value of human life if humans are more like machines.

9. **What could be awkward about machines being programmed to act more like humans?**

   It could lead to problems e.g. accidents, if machines behaved less logical and therefore more irrational even though people might feel more comfortable with certain aspects of such "human touch quality". In addition, the "personality design" of the machine might not match the user's requirements or preferences. Even much more simple controls like cruise control are desired by some and rejected by others.

10. **Could insurances continue their policies the way they are handled right now?**

    Certainly not because liability insurance only makes sense when someone can be held liable. At the moment, the driver is currently held responsible but in future if there is no driver this could imply various scenarios ranging from holding the manufacturer responsible straight to the programmers involved. Who decides on who is held responsible? Insurance companies need legal certainty on where any responsibility lies. One potential solution is no fault insurance that would still have to be paid by the vehicle owner.