Assignment 3

Submission Due Date: 5 Nov 2025

Note: Do not copy the case study in answer sheet. Straightway answer the question.

Case Study #1 Automotive Components, Safety Testing (by Harris, Pritchard, and Rabins)

Charlie Long is an electrical engineer working for a major automobile company in the year 2001. He works in the automatic sensors department, and his job is to design and test electronic sensors for use in different parts of cars. The latest version of the Lightning-Z100 was recently launched into the national market, equipped with an electronic sensor crucial to an innovative safety feature of the vehicle. This sensor was designed and tested by Charlie's department. The Lightning-Z100's major competitor equipped its comparable model (the Bolt-Z100) with a somewhat similar sensor two years before, and it apparently was effective in reducing the number of fatalities in head-on collisions.

Convinced that they could quickly come up with a design for an electronic sensor to match the Bolt-Z100's, Charlie's department committed to preparing one in time for the 2001 Lightning-Z100 model. Unfortunately, the design challenge proved to be more formidable than they expected, and they fell behind schedule. At the same time, they were under pressure to have something ready for the 2001 model. This, they were told by management and marketing strategists, could be the key to competing successfully with the Bolt-Z100. So, time was short, and Charlie's department could delay its recommendation no longer. Although the prototype was not subjected to as rigorous testing as usual, Charlie's department recommended a go-ahead. Charlie was uncomfortable with this decision. He objected that more testing was needed on sensors that served an important safety function. But he was overruled, and he pressed the issue no further. Several months after the Lightning-Z100 was on the road, a disturbing set of data emerged. A very high percentage of head-on collisions resulted in the death of passengers in the Lightning-Z100, much higher than similar collisions involving the Bolt-Z100.

As Charlie thought about this, he realized that the problem could lie in the new electronic sensor. The National Highway Traffic Safety Administration (NHTSA) decided to do a detailed study of the Lightning-Z100. Although it could not determine the precise nature of the problem, NHTSA found that, for some reason, the new electronic sensor was not functioning according to the design. All the new Lightning-Z100's would have to be recalled as soon as possible in order to avoid any more deaths from malfunctioning sensors. Charlie re-examined the design. Suddenly he realized that there was a very specific design flaw. He was not sure why this realization had come to him—it would not be obvious, even to experienced electrical engineers. But there it was, staring him in the face. Further testing might have revealed this earlier, but there had not been time for that. Meanwhile, many expensive lawsuits were being pressed against Charlie's company. Called in to testify in court, Charlie had a tough problem.

Discuss the following based on case study #1.

Should Charlie reveal everything (his belief that the testing was inadequate and his recent discovery) and cost the company a great deal of money? Or should he testify that he had been convinced that the testing was adequate?

Should he keep it to himself that he now knew that there was something wrong with the design?

Case Study #2 The Flaw in the Intel Pentium Chip (by C. Fleddermann)

Refer to the case study of Intel Pentium Chip in Lecture and discuss the followings.

1) Should flaws always be revealed to customers?

2) Is it an ethics problem only if safety is involved?

3) What if they added a label "This product may contain unexpected flaws and might not operate correctly under all conditions". Does this solve the ethical problems for the company?

4) How can an engineer be sure that there are no defects in a product?

5) If it is impossible to eliminate all defects in a product, what level of defects is acceptable?

6) Does this depend on the type of product?

Case Study #3 Product Safety (by Mike W. Martin and Roland Schinzinger)

"Airless" paint spray guns do not need an external source of compressed air connected to the gun by a heavy hose (although they do need a cord to attach them to a power source) because they have incorporated a small electric motor and pump. One common design uses an induction motor that does not cause sparking because it does not require a commutator and brushes (which are sources of sparking). Nevertheless, the gun carries a label warning users that electrical devices operated in paint spray environments pose special dangers. Another type of gun that, like the first, also requires only a power cord is designed to weigh less by using a high-speed universal motor and a disktype pump. The universal motor does require a commutator and brushes, which cause sparking. This second kind of spray gun carries a warning similar to that attached to the first, but it states in addition that the gun should never be used with paints that employ highly volatile and flammable thinners such as naphtha. The instruction booklet is quite detailed in its warnings. A painter had been lent one of the latter types of spray guns. To clean the apparatus, he partially filled it with paint thinner and operated it. It caught fire, and the painter was severely burned as the fire spread. The instruction booklet was in the cardboard box in which the gun was kept, but it had not been read by the painter, who was a recent immigrant and did not read English very well. He had, however, used the first type of airless paint spray gun in a similar manner without mishap. The warning messages on both guns looked pretty much the same.

Discuss the following based on the case study #3.

Do you see any ethical problems in continuing over-the-counter sales of this second type of spray gun? What should the manufacturer of this novel, lightweight device do?