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1(a) (i) ABET statement emphasizes that engineer should put safety, health and welfare as top priority. Masao Yoshida reacted correctly according to the statement. He stood as a good example to show that in all circumstances, engineers should always prioritize society's well-beings. Even though he knew it was extremely hazardous, he sacrificed his life to stay back Fukushima's nuclear plant to help reconstruct the place and help people there. As being one of the engineers at the plant, he knew that it was his responsibility to help people because he partially contributed to the damage. However, in contrast with Masao Yoshida, Lee Jun Seok showed a very bad example of engineers who only cared for his life and ignored other people's lives on the ferry. He was the ferry's captain, instead of standing till the end to calm people down and helping passengers to escape, he was among the first to flee on rescue boat. This is a very irresponsible action displayed by an engineer. In conclusion, the most important lesson learnt is that an engineers should always protect people's well-being, safety, health in all circumstances, even if they have to risk their lives.

(ii) Virtue ethics emphasizes character more than rights and rules. Character is the pattern of virtues (morally desirable features) and vices (morally undesirable features) in an individual. This guides engineers to take action according to what they think is morally desirable to protect people's safety and well-being and not just blindly follow rules.

(b)(i) Scientific Revolution

In the end of 16th century, Galileo developed the telescope from the observation of Jupiter's satellites, which concluded that the Earth revolved round the sun.

It was significant breakthrough as observation & experiment challenged centuries-old dogma to present a new view of nature. With that discovery, we further develop many more technological improvements, such as aerospace engineering.

(ii) Industrial Revolution

Adam Smith wrote the book, The Wealth of Nations, which emphasized the theory of division of labor and standardization for productivity of workers. Products of the same kind should be produced in a repetitive manner and we should break the jobs into as many small steps and procedures as possible.

With this approach, things are produced in more productive and efficient way. It is the stepping stone for the production of many instruments we have today and it transformed the way we produce things.

(c)(i) Engineering projects are social experiments that generate both new possibilities and risks, and engineers share responsibilities for creating benefits, preventing harm, and pointing out dangers.

(ii) According to the key theme above, all engineering projects should target to bring benefits to people in the society. Engineers should know the fact that engineering project may cause failure too, not always lead to success. So engineers should prepare themselves well and take responsibility in case failure happens. They should prepare for all cases, including precautions to prevent any dangers caused by the experiments and fix their errors made during the experiments.

2(a) (i) Moral dilemmas are situations in which moral reasons come into conflict and it is not clear what should be done. They arise in engineering because moral values are many and varied.

(ii) This is Utilitarianism versus Cost-Benefit Analysis Moral Framework.

According to utilitarianism, we ought always to produce the most goods for the most people, giving equal consideration to everyone affected. Cost-Benefit Analysis identifies the good and bad consequences of some action or policy based on cost.

NNSC stated that in all circumstances, they always ensure that their ship quality is good, even if they have to make a loss. Their top priority Is the quality of the ship, well-being and safety of people and not how much money they are making.

(b) (i) A professional engineer may publicize his practice or allow his employees or agents to do so. He shall not publish his practice in a manner which is likely to diminish public confidence in engineering profession or is regarded as being misleading, deceptive, false or is determined to be an undesirable manner by the Board.

(ii) A professional engineer shall refrain from expressing publicly an opinion on an engineer's work and shall not maliciously or recklessly injure or attempt to injure, directly or indirectly, the professional reputation, prospects or business of another professional engineer.

(c)(i) The foundation of ethical behavior morality. Morality is about principles distinguishing between right and wrong. Based on morality, ethical standards are established. The profession itself sorted out what constitute morality, based on that, they will set the guidelines that will become its ethical standard which are principles guiding behavior that are morally correct. Although there are standards, the deciding factor is personal moral sense, which is the ability to differentiate between right and wrong. Personal moral senses are different among every single person. For people with strong moral sense, they will have ethical behavior. While for people with weak moral sense, they may tend to be unethical. So even there are good ethical standards, it may not necessarily ensure ethical behavior among all engineers.

(ii) Moral Autonomy is person's ability to make decision and take actions based on his own moral principles rather than passive adoption of what is imposed on him.

There are 10 factors that make up moral autonomy such as moral coherence, moral communication, moral awareness, etc. Boisjoly fell short especially in moral communication, which is the ability to express moral issues clearly. When challenged by the management over his recommendation, he gave up. His moral autonomy was undermined and he was hence unable to deal effectively with the moral complexity of the situation. While his bosses were grappling with issues affecting the company, such as delayed launches, a growing backlog of projects, and competition from rival space agencies, Boisjoly gave up fighting for the good of the majority, (which included the people on the shuttle, and the morale of the nation).

According to key themes in engineering ethics is that engineering projects are social experiments that carry both possibilities and risks, and engineers are obliged to prevent harm and danger to the people affected by these projects. Therefore, the engineers had every obligation to ensure the safety of the space shuttle riders. Unfortunately, they failed in their duty to protect these people as eventually, all astronauts died.

Moral autonomy is important as if Boisjoly did exercise strong moral autonomy and fulfill an engineer's duty to protect those who use an engineer's work, the tragedy would not have happened.

3. (a) (i) A standard is a document approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method. In Singapore, its Singapore Standards e.g. "SS2" Standard for construction steel.

(ii) Standards contribute to interoperability which eases sourcing manufacture and use, mutual recognition resulting in cost reduction, productivity, protection of environment, health, quality, safety, meeting market needs resulting in economic viability and trade.

Engineers will have responsibility to follow standards to ensure good quality, compatibility of the products with the equipment already being used, as well as economical cost of the products.

(b) (i) Trademark protects identity of source of goods or services to prevent use of confusingly similar marks. Protection covers logos, slogans, distinctive packaging and product configurations. It allows consumers to identify the source of a good or service, and helps businesses protect their reputation and goodwill.

(ii) There are 2 types of patents. Design patent protects designs for articles of manufacture. Utility patent protects processes and machines and any new and useful improvements on them.

(iii) Before taking legal action to stop an infringer, an organisation should consider whether they actually need the infringer to stop. If the infringer owns patents, trademarks or copyrights that could be of interest to the organisation's business, it might be better to cross-licence to each other (win-win situation). Also, this could result in a stream of future income (royalties) from the infringer, which is turn, will be beneficial for the organisation.

(c)(i) Export Orientation:

- Import substitution failed due to small domestic market & no economy of scale. British withdrawal led to severe unemployment (loss of 50,000 jobs)
- Adopted export-orientation approach through industrialization
- Tariffs removed, exports grew, balance of payment improved, unemployment reduced
- EDB granted investment incentives to restructure hi-tech, high-value industry in late 70s

(ii) Knowledge-Based Economy: Globalization (WTO) & hyper-competition

- Liberalizing telecoms, banking & services industries (healthcare, education, tourism)
- Develop manufacturing & services clusters
- Enlarge external economy
- Further diversify foreign direct Investment (FDI) destinations to non-traditional countries
- Integrate domestic & external economies for bigger GNP
- Continue to attract foreign talents in IT, life-sciences, environment technology, electronics, digital media and other knowledge industries
- integrate domestic and external econ,foreign talent, resilience, external econs dev, diversify FDI to non-trad countries like middle east,
- Globalisation, competition, service focus, banking healthy etc

1. (a) (i) Under British Rule:
    - Organized strikes
    - Staged riots
    - Demanded self-government
    - Formed political parties (e.g. Labour Front (LF), Action Party (PAP))

These actions led to Birtish's preparation for limited self-government based on the Rendel Constitution structure of government in SG, further led to 1955 Election.

Lesson learnt: 1955 Election was the first fully democratic election. It got more parties to take part in and greater number of voters. Also, it firstly introduced compulsory voting. It was the time that Singapore can have an end point to British rule. It is the symbol of fully self-ruling, as Singaporeans have right to vote for their own parliament. It is the threshold of independence. Singapore learned the importance of self-ruling and independence.

(ii) Significant events when Singapore was a state of Malaysia:

There was stark rivalry between the PAP and the Alliance over the 1963 and 1964 elections followed by race riots and executing of the "Malaysian Malaysia" campaign. This led to separation from Malaysia and Singapore become an independent country in 9 August 1965.

Lesson learnt: SG should stand and fight for its rights so it can develop its economy and people further instead of depending on others and limiting its own potential.

(b) (i) External threat SG is facing is the spill-over effect of political instability in the region such as from Malaysia, Thailand, Indonesia. This is significant because it might influence some anti-government individuals in SG and might lead to strikes, riots in SG.

(ii) The influx of foreign workers might have negative impact on the social terrain of Singaporean culture. While an increase in the number of foreign immigrants means accelerated globalization and inflow of various cultures, it also shows some signs of eroding native culture. Personally, I think this effect is only valid to small extent. For instance, nowadays, in schools or workplace, hawker centers, shopping malls, I can see majority of Singaporeans speaking Chinese. This is not caused by foreigners but it is Singaporeans themselves who choose to speak the language they feel most comfortable with, making Singapore very similar to China. So the influx of foreigners should not be blamed for erosion of Singapore native culture.

The influx of foreign workers might reduce the number of jobs available for locals in SG. In my opinion, this is not valid. Singapore itself has very small population and small labor pool. Singapore is suffering from structural unemployment due to lack of local talents in certain areas and unwillingness of local people to undertake jobs that are paid lower in some sectors e.g manufacturing, construction, etc. So there is a need for foreign workers to take up jobs in these sectors. In this case, I believe the influx of foreigners plays a role in contributing to Singapore's economy.

(c) (i) Singapore is a small country with small population, small labour pool and restrain of natural resources. Sg needs to participate actively in ASEAN to get benefits from Free Trade Zone which entails the establishment of a single market and production base, where goods, services and investments, as well as skilled workers, will be able to flow freely between Singapore and various countries of ASEAN. ASEAN also helps Singapore resolve regional differences between Singapore and other countries in the region and maintains its political stability.

(ii) Globalization of production refers to sourcing of goods and services from locations around the world to take advantage of differences in cost or quality of the factors of production, labor, land and capital.

One important economic issue Singapore suffers is the limitation of natural resources and small labor pool. Singapore is so small and lacks of natural resources. This restrains the development of many industries. Globalization of production allows Singapore to import cheaper resources, labors from other countries. Besides, Singapore can also set up plants in other countries to get advantage of cheaper labors, land and capital.

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