



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 7 Examination in Engineering: October 2019

Module Number: IS7101

Module Name: Engineering Ethics

[Three Hours]

[Answer ALL questions. Each question carries 12 marks]

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- Q1 Why should Professional Engineers adhere to the following clauses of Engineering Ethics? Explain with possible consequences. (about 250 words per each)
- a) Engineers shall not knowingly participate in any act, which will result in waste or misappropriation of public funds (Dishonesty). [6.0 marks]
- b) Engineers shall give proper credit for professional work to those to whom credit is due (Acknowledge). [6.0 marks]
- Q2 Discuss the following scenarios while stating whether they are ethical or unethical practices to be followed as future Engineers according to the IESL Code of Ethics. (about 150 words per each)
- a) Mr. Dimuthu is a Chartered Civil Engineer who runs his own structural design company. There are several other civil engineers who work under his guidance in this company. They are involved with structural design works as per the requirements of their clients for local construction industry. Recently, Mr. Dimuthu has advised his staff to charge extremely low professional fees for their structural design works from their clients in order to attract more and more clients for his company. [4.0 marks]
- b) Mr. Herath is a Mechanical Engineer attached to a chemical manufacturing company. Few types of harmful chemical by products are released to the nearby river with waste water from the company since last week due to an ongoing maintenance work. This maintenance work will be carried out continuously for another 3 months. Mr. Herath informed this issue to his boss. However, the boss told Mr. Herath that "Since we have not yet received any complaints from villagers about waste water, we do not need to worry about this issue too much". So, Mr. Herath neglected this waste water problem without taking any further action. [4.0 marks]

- c) Mr. Kamal is an Electrical Engineer working in a leading electrical installation company in Sri Lanka. This company buys large quantities of electrical equipment and wires from local and foreign suppliers. After checking the quality and other requirements, Mr. Kamal is responsible to provide approval for electrical equipment and wires necessary for the company. However, few equipment supplier companies give extra commission to Mr. Kamal in order to get their equipment and wire lots approved. Mr. Kamal gives approval for electrical equipment and wires supplied by them even without checking the quality.

[4.0 marks]

- Q3 a) Academic dishonest acts are now becoming a serious issue in universities with the development of technology. A minority of engineering students are also involved with such acts during their undergraduate period. We all know that engineering profession requires honesty, integrity and reliability to a great extent. However, engineering students who are involved in academic dishonest acts during their undergraduate period, can behave similarly in the industry as unethical engineers after passing out from the universities. Considering at least three academic dishonest acts, explain how such dishonest acts can be eradicated from engineering students' practice.

(about 100 words per each)

[6.0 marks]

- b) Suppose you are an expert in Engineering Ethics. You are asked to develop a code of ethics for politicians (ministers, parliamentarians etc.) in Sri Lanka with respect to the IESL code of ethics to minimize the corrupt practices of politicians. Propose at least 3 major points from the IESL code of Ethics and discuss why you have selected them to include in the code of ethics for politicians

(about 100 words per each)

[6.0 marks]

- Q4 Ms. Jennifer Fernando, an electrical engineer at a large industrial company, has been assigned to fix an electrical problem that recently occurred at one of the company's chemical plants which caused fatal injuries to a few employees. Upon Jennifer's investigation into the situation, she determines the following:

- A large power conditioner caught fire because installation did not meet electrical engineering standards; it lacked the use of a neutral, the conditioner was undersized given the electrical load demands and inadequate overcurrent protection was provided. The conditioner overheated and caught on fire causing fatal injuries for few employees. Further, the fire caused the fire suppressant system to turn on, which again caused damage to other equipment.

- The electrical installation was designed and installed by Mr. Mark Perera, an individual without a recognized engineering background or formal education. He is a close relation of Ms. Jennifer's boss and undertakes small scale subcontracts of household wiring.

Ms. Jennifer redesigned the electrical installation to meet electrical engineering standards and to ensure it would function properly and not be a safety hazard. Upon completion of the repairs, she wrote a report describing the incompetent and faulty design of the electrical installation. Ms. Jennifer's boss was uninterested in her investigative report and promptly ignored it. Ms. Jennifer's boss further compelled company management to recognize this issue not as an official safety issue and just wanted to forget it happened. Ms. Jennifer was worried about her boss's behavior and kept silent without going against her boss. However, she was concerned that Mr. Mark Perera would continue to perform engineering services for the company and that other improper engineering designs would be constructed in future. Few months later, Ms. Jennifer got to know that her boss has awarded another electrical installation project of the company to Mr. Mark Perera as a subcontract.

(Original Source: Engineering Ethics ; Real World Case Studies authored by Steven K. Starrett, Amy L. Lara & Carlos Bertha, 2017)

- Identify 4 unethical aspects in this case [2.0 marks]
- If you are the electrical engineer in that company like Ms. Jennifer Fernando, explain how you will behave in that company when you observe unethical acts of the boss as mentioned in the case. (About 150 words) [4.0 marks]
- Discuss why engineers should perform professional services only in competent areas and undertake engineering works only when qualified by education and experience in the specific technical fields involved. (About 300 words) [6.0 marks]

Q5 Peter, a mechanical engineer has been working as the Bigness Oil Company's consultant engineer since last year, and he has established a strong, trusting relationship with Jesse, manager of the storage terminal of that company situated in a rural area. The storage terminal, on Peter's recommendations, has followed all of the environmental regulations to the letter, and it has a solid reputation with the state regulatory agency. The terminal receives various petrochemical products via underground pipelines and tank trucks, and it blends them for resale to the private sector. Jesse has been so pleased with Peter's work that he has recommended that Peter be retained as the corporate consulting engineer for the next 5 years also. This would be a significant advancement for Peter.

One day, over coffee, Jesse tells Peter a story about a mysterious loss in one of the raw petrochemicals he receives by pipeline 1.5 years ago. It was discovered when the books were audited. There were apparently 10,000 gallons of the petrochemical

missing. After running pressure tests on the pipelines, the plant manager found that one of the pipes had corroded and had been leaking the chemical into the ground. The reason for the corrosion of that pipe line was due to the stoppage of the pipe lines' maintenance activities by company management to save money without considering the safety.

After stopping the leak, the company sank observation and sampling wells and found that the petrochemical was diffusing vertically slowly into a deep aquifer (ground water sources) without coming to the surface of the ground. Once it mixes with the deep aquifer, harmful petrochemicals will be spread over a large area and affect human health. Since there was no surface or groundwater pollution off the plant property, the plant manager decided to do nothing. Jesse thought that somewhere under the plant there it is still being diffusing underground, although the last tests from the sampling wells showed that the concentration of the chemical in the groundwater within 400 feet of the surface was essentially zero. The wells were capped, and the story never appeared in the media.

Peter is taken aback by this apparently innocent revelation. He recognizes that state law requires him to report all petrochemical leakages, but what about leakage that occurred 1.5 years ago, where the effects of the leakage seem to have dissipated? He frowns and says to Jesse,

"We have to report this leakage to the relevant authorities, you know."

Jesse is incredulous.

"But there is no leakage. If the authorities made us look for it, we probably could not find it; and even if we did, it makes no sense whatever to pump it out or contain it in any way."

"But the law says that we have to report . . .," replies Peter.

"Hey, look. I told you this in confidence. Your own engineering code of ethics requires client confidentiality. And what would be the good of complaining to the authorities? There is nothing to be done. The only thing that would happen is that the company would get into trouble and have to spend useless dollars to correct a situation that cannot be corrected and does not need remediation." replies Jesse.

"But . . ."

"Peter, let me be frank. If you go to the authorities with this, you will not be doing anyone any good—not the company, not the environment, and certainly not your own career. I cannot have a consulting engineer who does not value client loyalty like this way." replies Jesse.

(Original Source : Text Book of Engineering Ethics ; Concepts & Cases authored by Charles E. Harris, Michael S. Pritchard & Michael J. Rabins, 2009)

- a) Identify 2 acts which violated Engineering Ethics in the given case. [2.0 marks]
- b) Comment on the last two replies of the plant manager (Jesse) to Peter according to Engineering Ethics (About 150 words) [4.0 marks]
- d) Discuss about Engineer's ethical responsibilities towards the environment according to the IESL Code of Ethics. (About 300 words) [6.0 marks]