UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 6 Examination in Computer Engineering: May 2026

Module Number: IS 5101 **Module Name: Engineering Ethics (C18)**

[Three Hours]

[Answer ALL questions. Each question carries 12 marks]

Q1 Why should professional engineers adhere to the following clauses of IESL code of ethics? Explain with possible consequences. (about 250 words per each)

a) Engineers shall always act in such a manner as to uphold and enhance the honour, integrity and dignity of the profession while safeguarding public interest at all times.

[6.0 marks]

b) Engineers shall build their reputation on merit and shall not compete unfairly.

[6.0 marks]

Q2 Discuss the following scenarios while stating whether they are **ethical** or **unethical** practices to be followed as future computer engineers according to the IESL code of ethics.

(about 150 words per each)

a) Eng. Dilan, who is an expert computer engineer was hired by Lanka Mart Pvt Ltd. to evaluate and recommend a suitable Enterprise Resource Planning (ERP) system to digitize and streamline their operations. His role was to provide unbiased technical consultation, assess various vendors, and recommend the most appropriate and cost-effective ERP solution for the company. During the evaluation process, Eng. Dilan recommended a particular ERP system developed by a vendor called TechNova Solutions, citing its flexibility and scalability. Based on his professional recommendation, Lanka Mart decided to purchase the system for 4.5 million rupees. Several months later, it was revealed through internal audits that Eng. Dilan had received a commission of 500,000 rupees from TechNova Solutions for securing the deal. This financial benefit was never disclosed to the client, and it was further discovered that there were other vendors who had better solutions at lower costs, which were not fully presented or evaluated during the consultation.

[4.0 marks]

b) Eng. Nuwani was leading a development team at NeoTech Solutions, a company contracted to build a customized e-commerce platform for a new startup, GreenCart.lk. The timeline was tight, and pressure to deliver quickly

was high. In order to meet the deadline, Eng. Nuwani decided to incorporate modules from a previous employer's proprietary software code she had worked on during her time at CodeSphere (Pvt) Ltd. These modules included payment gateway integration and inventory management components, which were specifically developed and licensed for CodeSphere's clients only. She integrated the code into GreenCart.lk's platform without seeking permission from CodeSphere or informing her current employer that the code was not open source or owned by her. The platform was launched using the copied components to meet the deadline.

[4.0 marks]

c) Eng. Tharindu was overseeing the development of a cloud-based financial application at SecureByte Technologies, which was being built for a major local bank. During the final documentation phase, the project needed a formal sign-off on the network security and encryption architecture before deployment. Although Tharindu had experience in general systems design and software development, the cybersecurity component was designed by an external expert consultant in collaboration with the company's internal cybersecurity team. The documentation for firewalls, encryption protocols, and multi-factor authentication layers was highly technical and outside of Tharindu's core area of expertise. The management, in a rush to submit the final report, requested Eng. Tharindu to sign off on the entire architecture document as the lead engineer, even though he had not directly supervised or reviewed the security design in detail. Eng. Tharindu declined to sign the document, highlighting several reasons.

[4.0 marks]

Q3 a) *"The Inventor: Out for Blood in Silicon Valley* is a 2019 English-language documentary film based on the Theranos scandal. The documentary highlights various unethical behaviors exhibited by Ms. Elizabeth Holmes, the founder and CEO of Theranos Corporation. Assuming Ms. Holmes is a professional engineer running her own company (although in reality, she is not), explain three unethical behaviors demonstrated by her in the movie in detail, and discuss their consequences on the Theranos Corporation *(Students enrolled in the IS 5101 – Engineering Ethics module were requested to watch this film before the examination. To facilitate this, the lecturer provided necessary instructions and resources on the LMS).*

(about 100 words per each)
[6.0 marks]

b) Suppose you are an expert in Engineering Ethics and have been asked to develop a code of ethics for politicians (ministers, parliamentarians, etc.) in Sri Lanka, based on the IESL code of ethics, to minimize corrupt practices. Propose at least three major clauses from the IESL code of ethics and discuss why you selected each one to be included in the code of ethics for politicians.

(about 300 words)
[6.0 marks]

Q4 The Therac-25 was a computerized radiation therapy machine developed in the early 1980s by **Atomic Energy of Canada Limited (AECL)**. Unlike its predecessors, it relied heavily on software to manage safety features and control high-energy radiation delivery. From a computer engineering standpoint, the Therac-25 incident represents one of the most tragic examples of software failure leading to loss of life. Between 1985 and 1987, six known patients received massive radiation overdoses due to undetected software errors in the Therac-25 system. These overdoses resulted in serious injuries and, in some cases, death. Investigations revealed that software bugs allowed operators to unknowingly override safety interlocks, permitting unsafe doses of radiation. One critical error involved a race condition: if operators entered treatment parameters rapid, the software could misinterpret it, causing the machine to deliver full doses without proper beam attenuation. From an engineering ethics standpoint, several failures are apparent. First, there was an overreliance on software without adequate testing, redundancy, or fail-safe mechanisms. Engineers removed hardware interlocks that had been present in previous models, assuming the software would reliably prevent unsafe conditions. Second, AECL failed to respond adequately to early reports of accidents, delaying investigations and dismissing operator complaints. Most critically, the software had not been independently verified, and safety-critical components lacked formal validation or documentation. Therac-25 serves as a stark reminder that software bugs can have lethal consequences and that engineers must anticipate and design for failure, not assume perfection.

a) Identify four (4) unethical actions by the engineers and company (AECL) involved in the Therac-25 case, as described.

[2.0 marks]

b) If you were the chief software engineer at AECL during the development of the Therac-25, what technical and ethical measures would you have implemented to prevent the accidents? Discuss your actions with reference to engineering best practices and ethical standards.

(About 150 words)
[4.0 marks]

c) Discuss why engineers shall hold paramount the health, safety and welfare of the public in the performance of their professional duties while taking precedence over their responsibility to the profession, sectoral or private interests, employers or to other engineers. (About 300 words)
[6.0 marks]

Q5 In 2015, the **Environmental Protection Agency (EPA)** in the United States revealed that **Volkswagen (VW)**, one of the world's largest car manufacturers, had deliberately installed software in its diesel vehicles to cheat emissions tests. The embedded software, often referred to as a "defeat device," detected when the car

was undergoing laboratory emissions testing and temporarily activated full emissions controls to meet legal standards. However, under normal driving conditions, the controls were reduced or deactivated, causing the cars to emit up to 40 times the legal limit of nitrogen oxides. From a computer engineering perspective, the scandal involved a clear misuse of embedded systems and software programming. Engineers developed code specifically designed to mislead regulators and the public. This was not an accidental software defect, it was intentional deception encoded into the vehicle's control software. The scandal raises significant ethical concerns. Engineers knowingly compromised environmental standards and public health to meet business goals. Over 11 million vehicles worldwide were affected, resulting in billions of dollars in fines and irreparable damage to Volkswagen's reputation. For computer engineers, this case emphasizes the ethical responsibilities tied to writing and deploying software. Code is not neutral—how it's designed and used can have serious social and environmental impacts. The VW case illustrates how unethical engineering decisions, even in code that seems "invisible," can lead to global consequences.

a) Why is the Volkswagen scandal considered an ethical violation from a computer engineering perspective?

[2.0 marks]

b) List two key ethical principles violated by the engineers involved in the scandal.

[2.0 marks]

c) Assume you are the chief computer engineer working at the above - mentioned Volkswagen company . Managing Director of the Volkswagen (your boss) has instructed you to design and implement the defeat device software into all diesel vehicles of the Volkswagen company. What will you do in such a situation as an ethical engineer? Explain your answer.

(About 100 words)
[2.0 marks]

d) Discuss about engineer's ethical responsibilities towards the environment according to the IESL code of ethics. (About 300 words)
[6.0 marks]