



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRONIC ENGINEERING

THE PROFESSIONAL ENGINEER

EEE 2255

March 2025

This examination paper consists of 4 pages

Time Allowed: 3 Hours

Total Marks: 100

Examiner's Name: Eng. J Mwanza

INSTRUCTION AND INFORMATION TO THE CANDIDATE

- 1. Answer ALL parts of Section A and any THREE questions from Section B.**
- 2. Section A carries 40 marks and Section B carries 60 marks.**
- 3. Start each question on a new page**
- 4. Use of calculators is permissible**

MARK ALLOCATION

<u>QUESTION</u>	<u>MARKS</u>
<u>1</u>	<u>40</u>
<u>2</u>	<u>20</u>
<u>3</u>	<u>20</u>
<u>4</u>	<u>20</u>
<u>5</u>	<u>20</u>
<u>Total marks attainable by candidate</u>	<u>100</u>

SECTION A

Question 1

- a) Define science and engineering. How do they differ in terms of their objectives?
[5 Marks]
- b) Differentiate between theoretical and applied research, providing an example for each from science and engineering.
[5 Marks]
- c) Using two specific examples of engineering products or solutions, explain how science and engineering are interdependent. Discuss how scientific principles contribute to engineering innovations and how engineering, in turn, advances scientific discovery. **[8 Marks]**
- d) Businesses adopt different models to generate revenue and create value for customers.
- i. Define a business model and explain its importance in a company's success.
[4 Marks]
 - ii. Compare and contrast the subscription-based and freemium models, providing examples of businesses that use each.
[8 Marks]

SECTION B

Question 2

- a) A husband provides his wife with capital to start a business selling hair wigs and weaves. However, one of her employees begins selling defective wigs, which cause significant health risks to customers. As a result, the affected customers sue both the business and its owners.
- i. Identify the type of business structure under which the wife's business falls, providing justification for your answer. **[4 Marks]**
 - ii. Discuss whether the husband can be legally liable in the lawsuit, considering business ownership and liability principles. **[6 Marks]**
- b) State two advantages and two disadvantages of Mail order companies. **[4 Marks]**
- c) Outline using examples any three advantages of the affiliate marketing concept **[6 Marks]**

Question 3

- a) Define the term "Ideation" and explain its significance in problem-solving. **[3 Marks]**
- b) Define "Innovation" and describe its role in technological and societal advancements. **[3 Marks]**
- c) Using a practical example, explain the key difference between ideation and innovation, highlighting how one leads to the other. **[4 Marks]**
- d) Explain how WhatsApp and Facebook can serve as platforms for ideation. Discuss how these platforms facilitate brainstorming, collaboration, and idea development in various fields. **[6 Marks]**
- e) Describe the concept of ideation using the standard input-output process model. Explain the key inputs, the transformation process, and the expected outputs in the context of generating new ideas. **[4 Marks]**

Question 4

- a) Define ethics. **[2 Marks]**
- b) State 4 different approaches to ethics. Give an example for each case. **[3 Marks]**
- c) An engineer working for a construction company discovers that substandard materials are being used in a bridge project to cut costs. When they raise concerns, their manager insists

that the materials meet the minimum legal requirements and advises them to remain silent to avoid project delays.

- i. Identify and explain three key ethical principles that the engineer must consider in this situation. **[6 Marks]**
- ii. Discuss the possible consequences of ignoring the ethical concerns, both in the short and long term. **[5 Marks]**
- iii. Suggest a professional course of action the engineer should take, referencing ethical guidelines from engineering codes of conduct. **[4 Marks]**

Question 5

- a) Using a solar-power installation company as an example, explain the micro-environmental forces that influence its operations. For each force identified, provide a brief strategy as the business owner on how to effectively manage or mitigate its impact. **[10 Marks]**
- b) Explain with examples the outline 5 reasons why engineers and other professionals carry out research. **[10 Marks]**

End of Exam