

University of A. Mira – Béjaïa
Faculty of Technology
Department of Technology
Exam – Normal Session
Module : Engineering Professions (Métiers de l'ingénieur)
Level: 1st Year Engineering– ST & TM Cycles
Academic Year: 2024–2025

1- Answer the following questions:

- a. What is the main job of an engineer?
- b. What is sustainability, and why is it important for engineers?
- c. What is the difference between automation engineering and industrial engineering?

2-Choose one of the following engineering fields and describe its main purpose, real-world applications, and the role of a specialist in that field:

- Mechanical Engineering
- Electronics Engineering
- Electromechanical Engineering
- Process engineering
- Aerospace Engineering
- Civil Engineering

3- The Blind Test – Who Am I? Read each description. Based on the clues, identify the correct engineering field.

- a) I design and maintain systems that control temperature, air quality, and humidity in smart buildings. ► **Answer:** _____
- b) I work with semiconductors and embedded software to build sensors, circuit boards, and electronic systems in cars and phones. ► **Answer:** _____
- c) I use mathematical models to improve traffic flow and ensure safety on roads and railways. ► **Answer:** _____
- d) I turn hydrocarbons into chemical products like synthetic rubber, plastics, and fertilizers. ► **Answer:** _____
- e) I focus on refining metals, studying their physical properties, and shaping them through casting and forging. ► **Answer:** _____
- f) I integrate mechanical and electrical systems in things like elevators, wind turbines, and industrial automation. ► **Answer:** _____
- g) I use heat exchangers, distillation columns, and reactors to transform raw materials into finished products. ► **Answer:** _____

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Exam Answers

1- Answer the following questions:

a. What is the main job of an engineer? The main job of an engineer is **problem solving** through the application of scientific and mathematical principles to **design, analyze, and optimize** systems. Engineers also manage projects, innovate, and communicate technical information effectively **(2pts)**.

b. What is sustainability, and why is it important for engineers?

Sustainability refers to the development of systems and technologies that **meet present needs without compromising the ability of future generations to meet their own needs**. It is important for engineers because they are responsible for creating **safe, useful, and environmentally friendly technologies**, which help address modern challenges like **renewable energy, circular economy, and resource efficiency (2.5 pts)**.

c. What is the difference between automation engineering and industrial engineering? (2.5 pts)

- **Automation Engineering** involves designing systems that perform tasks **without human intervention** using technologies like **control systems, feedback loops, sensors, and actuators**.
- **Industrial Engineering** focuses on **optimizing processes and systems** by integrating people, machines, materials, and information using tools such as **lean manufacturing, process mapping, and operations research**.

2- Students are asked to choose just one engineering field and describe its main purpose, real-world applications, and the role of a specialist in that field. (6 pts)

1. Mechanical Engineering

Main Purpose:

Mechanical engineering focuses on the design, analysis, manufacturing, and maintenance of mechanical systems. It applies principles of thermodynamics, mechanics, and materials science to create machinery and tools.

Real-World Applications:

- Automotive industry: internal combustion engines, electric vehicle systems
- Robotics and automation systems

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- (Heating, Ventilation, and Air Conditioning) HVAC systems and turbines
- Manufacturing processes and mechanical tools
- Medical devices like prosthetics and surgical robots

Role of a Specialist:

A mechanical engineer designs and optimizes machines and systems, selects suitable materials, performs thermal and structural analyses, and ensures mechanical efficiency, durability, and safety during operations.

2. Electronics Engineering

Main Purpose:

This field deals with the design and development of electronic devices, circuits, and systems that use semiconductors and embedded software.

Real-World Applications:

- Smartphones, computers, and consumer electronics
- Automotive control systems
- Home automation (Domotics)
- Medical electronics (e.g., biosensors)
- Industrial controllers and sensors

Role of a Specialist:

An electronics engineer designs circuit boards, programs microcontrollers, integrates electronic components into systems, and ensures functionality through testing and simulation.

3. Electromechanical Engineering

Main Purpose:

Electromechanical engineering integrates electrical and mechanical systems to achieve automated or responsive operations in various machines and devices.

Real-World Applications:

- Elevators and escalators
- Wind turbines and renewable energy systems
- Robotics and automated manufacturing lines
- Home appliances and medical equipment

Role of a Specialist:

An electromechanical engineer oversees the integration of mechanical and electrical components,

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manages maintenance, ensures efficient operation, and develops control systems for hybrid machines.

4. Process Engineering

Main Purpose:

Process engineering transforms raw materials into valuable products through chemical, physical, or biological processes in industrial settings.

Real-World Applications:

- Petrochemical and oil refining (e.g., distillation, cracking)
- Pharmaceutical production (e.g., drug synthesis, fermentation)
- Agro-food processing (e.g., pasteurization, drying)
- Waste treatment and water purification

Role of a Specialist:

A process engineer designs process flows, simulates operations using specialized software, ensures safety and compliance, and improves efficiency and sustainability in production units.

5. Aerospace Engineering

Main Purpose:

Aerospace engineering focuses on the design, development, and maintenance of aircraft and spacecraft, ensuring safe and efficient flight.

Real-World Applications:

- Design of commercial aircraft and drones
- Spacecraft propulsion systems and satellite design
- Avionics: autopilot, radar, navigation systems
- Structural analysis for lightweight materials

Role of a Specialist:

An aerospace engineer performs aerodynamic modeling, tests structural components, develops propulsion systems, and ensures compliance with flight safety regulations and performance standards.

6. Civil Engineering

Main Purpose:

Civil engineering deals with the planning, construction, and maintenance of infrastructure projects such as roads, bridges, buildings, and water systems.

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Real-World Applications:

- Design and construction of highways, railways, and bridges
- Structural design for buildings and stadiums
- Urban planning and public buildings
- Dams, airports, and sanitation networks

Role of a Specialist:

A civil engineer (e.g., structural, geotechnical, or urban) ensures safe and sustainable design, coordinates construction processes, conducts soil and material analysis, and applies digital tools like BIM and AutoCAD for project execution.

3- The Blind Test – Who Am I? (7pts)

a) I design and maintain systems that control temperature, air quality, and humidity in smart buildings. ➤ **Answer: Mechanical Engineering** (Because HVAC falls under mechanical systems and thermodynamics)

b) I work with semiconductors and embedded software to build sensors, circuit boards, and electronic systems in cars and phones. ➤ **Answer: Electronics Engineering**

c) I use mathematical models to improve traffic flow and ensure safety on roads and railways. ➤ **Answer: Civil Engineering** (Transport engineering is a subfield of civil engineering)

d) I turn hydrocarbons into chemical products like synthetic rubber, plastics, and fertilizers. ➤ **Answer: Process Engineering**

e) I focus on refining metals, studying their physical properties, and shaping them through casting and forging. ➤ **Answer: Metallurgical Engineering**

f) I integrate mechanical and electrical systems in things like elevators, wind turbines, and industrial automation. ➤ **Answer: Electromechanical Engineering**

g) I use heat exchangers, distillation columns, and reactors to transform raw materials into finished products. ➤ **Answer: Process Engineering**