



# UNIVERSITY OF RUHUNA

## Faculty of Engineering

End-Semester 8 Examination in Engineering: December 2025

**Module Number: ME8202    Module Name: Lean Manufacturing and Supply Chain Management**

**[Three Hours]**

**[Answer all questions, each question carries 10 marks]**

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- Q1.** a) Provide a definition of Life Cycle Assessment (LCA) and explain, in brief, how it contributes to sustainable decision-making within supply chain operations. [2.0 Marks]
- b) Major buyers in the EU, UK, and US now place strong emphasis on compliance with ethical labour standards, supply chain traceability, and environmental performance. Sustainable sourcing has therefore become essential for Sri Lankan apparel manufacturers to retain market access.
- What is your perspective on this requirement ? [3.0 Marks]
- c) Identify and briefly explain, with an example, how emerging technologies such as Artificial Intelligence (AI) or blockchain can enhance supply chain management. [5.0 Marks]
- Q2.** a) Define supply chain optimisation and outline its primary objectives. [2.0 Marks]
- b) Briefly explain the purpose of **cost-benefit analysis** in evaluating supply chain improvement initiatives. [3.0 Marks]
- c) Identify **three** key weaknesses in Sri Lanka's fruit and vegetable supply chain and propose suitable measures to enhance its performance. [5.0 Marks]
- Q3.** A major National Health Service (NHS) outpatient department has been receiving recurring complaints regarding delayed appointment letters, resulting in missed appointments, rework, and patient dissatisfaction. Senior management attributes the issue to non-adherence to procedures and intends to impose disciplinary measures. As a Lean Six Sigma practitioner, you are asked to define and work on the problem properly before solutions are considered.
- a) Formulate a strong problem statement grounded in measurable data, ensuring it remains free of assumptions or pre-determined solutions. [2.5 Marks]

*Q3. Continues to the next page*

- b) Translate customer voice statements into two Critical-to-Quality (**CTQ**) attributes and specify the corresponding measurement criteria for each. [2.5 Marks]
- c) Construct a high-level Suppliers-Inputs-Process-Outputs-Customers (**SIPOC**) diagram and identify potential stages where process variation may arise. [2.5 Marks]
- d) Identify **three** key stakeholders and explain their likely interests and influence on the project. [2.5 Marks]

- Q4.**
- a) Explain the main objective of the **measure stage** in the **DMAIC** (Define-Measure-Analyse-Improve-Control) improvement framework. [2.0 Marks]
  - b) Define the concept of baseline performance and list two straightforward graphical methods that can be used to visualise and assess it. [2.0 Marks]
  - c) Describe the consequences of weak or inaccurate measurement in the **measure phase** and analyse how it could hinder decision-making and effectiveness in the later DMAIC phases. [3.0 Marks]
  - d) Briefly describe three analytical tools used in the Analyse phase of Lean Six Sigma. [3.0 Marks]

- Q5.**
- a) **Scenario:** A manufacturing facility producing mechanical components is facing delayed deliveries and elevated operating costs. Observations indicate frequent material movement between distant workstations, operator idle time while waiting for machines, and the production of large batches merely to maintain machine utilisation. Using Lean principles,
    - (i) Identify and explain **four** types of Lean waste present in this Scenario. [2.0 Marks]
    - (ii) Recommend suitable Lean tools or practices to mitigate **any two** of Q5. a) (i) wastes. [2.0 Marks]
  - b) Briefly explain the significance of Value Stream Mapping (**VSM**) for organisations aiming to enhance operational performance. [3.0 Marks]
  - c) Explain the purpose of the 5S methodology and discuss how it contributes to improved efficiency, safety, and quality within organisations. [3.0 Marks]