

Study Programme	: Bachelor of Science Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	DMX7402 – Analysis of Manufacturing systems & Processes
Academic Year	: 2024/25
Date	: March 04, 2026
Time	: 13:30 hrs. – 16:30 hrs.
Duration	: 3 hours

General instructions

- 1) Read all instructions carefully before answering the questions.
 - 2) This question paper consists of 05 questions. All questions carry equal marks.
 - 3) Answers all questions.
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Question 01.

- a) Define a manufacturing system and explain its essential components with suitable examples. (6 marks)
- b) Discuss the importance of analyzing manufacturing systems in improving productivity, efficiency, and competitiveness. (7 marks)
- c) Explain the major challenges in analyzing and optimizing manufacturing systems, including variability, uncertainty, and system complexity. (7 marks)

Question 02.

- a) Discuss the major decision-making factors involved in the design of a manufacturing system and analyze their impact on cost and operational efficiency. (7 marks)
- b) Define and explain the following performance measures used in manufacturing system analysis: Throughput, Work-in-Process (WIP), Cycle Time, Utilization. (8 marks)
- c) Explain the various types of models employed in manufacturing systems analysis and discuss their applications in performance evaluation and system optimization. (5 marks)

Question 03.

- a) Define deterministic and stochastic models in manufacturing systems analysis. Clearly distinguish between the two types with suitable examples. (8 marks)
- b) Define production flow lines and explain their key characteristics. (6 marks)
- c) Explain how bottlenecks affect manufacturing system performance. Discuss methods for identifying and resolving bottlenecks. (6 marks)

Question 04.

- a) Define cellular manufacturing and explain its core principles. Provide suitable examples of applications. (7 marks)
- b) Discuss the advantages and disadvantages of Flexible Manufacturing Systems (FMS) in adapting to changing production demands. (7 marks)
- d) Explain the role of Computer-Integrated Manufacturing (CIM) in modern manufacturing systems and its benefits. (6 marks)

Question 05.

- a) A single-machine workstation is used to process parts in a manufacturing system. The system parameters are:
 - Processing time per part = 20 minutes per part
 - Arrival rate of parts = 2.4 parts per hour
 - Machine availability = 92%
- i) Calculate the effective service rate of the machine. (4 marks)
- ii) Calculate the machine utilization. (4 marks)
- iii) Determine the maximum achievable throughput of the system. (4 marks)
- iv) Compute the average number of parts in the system (WIP) using Little's Law. (4 marks)
- v) Estimate the average cycle time of a part in the system. (4 marks)