

Faculty of Engineering

End Semester Examination May 2025

RA3EL06 Industry 4.0

Programme	:	B.Tech.	Branch/Specialisation	:	RA
Duration	:	3 hours	Maximum Marks	:	60

Note: All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary.
 Notations and symbols have their usual meaning.

Section 1 (Answer all question(s))

- | | Marks CO BL |
|---|-------------|
| Q1. The transition from Industry 1.0 to Industry 4.0 is primarily driven by advancements in: | 1 1 1 |
| <input type="radio"/> Steam power <input checked="" type="radio"/> Digital technologies | |
| <input type="radio"/> Mechanization <input type="radio"/> Assembly lines | |
| Q2. Which of the following technologies is central to the implementation of smart factories in Industry 4.0? | 1 1 2 |
| <input type="radio"/> Pneumatic systems <input checked="" type="radio"/> Internet of Things (IoT) | |
| <input type="radio"/> Hydraulic power <input type="radio"/> Mechanical linkages | |
| Q3. Cloud computing in Industry 4.0 is primarily used for: | 1 2 2 |
| <input type="radio"/> Increasing physical storage space <input checked="" type="radio"/> Enhancing remote accessibility and data analysis | |
| <input type="radio"/> Reducing factory workforce <input type="radio"/> Replacing traditional robotics | |
| Q4. What role does Big Data analytics play in smart manufacturing? | 1 2 2 |
| <input type="radio"/> Manual data collection <input checked="" type="radio"/> Enhanced decision-making through predictive insights | |
| <input type="radio"/> Reducing automation capabilities <input type="radio"/> Eliminating the need for human intervention | |
| Q5. Which of the following best describes collaborative robotics in Industry 4.0? | 1 3 2 |
| <input type="radio"/> Robots working in isolation <input checked="" type="radio"/> Robots and humans working together | |
| <input type="radio"/> Robots replacing human workers entirely <input type="radio"/> Robots programmed only for a single task | |
| Q6. Robotic Process Automation (RPA) is primarily used for: | 1 3 2 |
| <input checked="" type="radio"/> Repetitive and rule-based tasks <input type="radio"/> Complex decision-making processes | |
| <input type="radio"/> Physical assembly tasks <input type="radio"/> Data storage management | |
| Q7. Digital twin technology is best defined as: | 1 4 1 |
| <input type="radio"/> A physical replica of a manufacturing process <input type="radio"/> A cloud-based storage system | |
| <input checked="" type="radio"/> A virtual representation of physical assets <input type="radio"/> A substitute for automation | |
| Q8. Which of the following is a cybersecurity challenge in Industry 4.0? | 1 4 2 |
| <input checked="" type="radio"/> Vulnerability to cyberattacks <input type="radio"/> Increased hardware costs | |
| <input type="radio"/> Lack of automation <input type="radio"/> Decreased data availability | |
| Q9. Predictive maintenance in Industry 4.0 aims to: | 1 5 2 |
| <input type="radio"/> Repair equipment after failure <input type="radio"/> Reduce the workforce in manufacturing | |
| <input type="radio"/> Eliminate the need for sensors in machines <input checked="" type="radio"/> Identify and address potential issues before failure occurs | |

Q10. Smart energy management in Industry 4.0 is focused on:

1 5 2

- Increasing energy consumption
- Optimizing energy usage and sustainability
- Reducing automation capabilities
- Limiting digital technology implementation

Section 2 (Answer all question(s))

Q11. Describe the key principles of Industry 4.0.

Marks CO BL
2 1 1

Rubric	Marks
Identification of key principles - 1 mark Brief explanation of each principle - 1 mark	2

Q12. Explain the evolution of industrial revolutions from Industry 1.0 to Industry 4.0.

3 1 2

Rubric	Marks
Mentioning all four industrial revolutions - 1 mark Explanation of key features of each revolution - 2marks	3

Q13. (a) Discuss the impact of Industry 4.0 on robotics and automation.

5 1 3

Rubric	Marks
Explanation of Industry 4.0's role in automation - 1mark Integration of AI, IoT, and smart robotics - 2marks Impact on productivity, efficiency, and flexibility - 2 marks	5

(OR)

(b) Compare and contrast the key differences between Industry 3.0 and Industry 4.0.

Rubric	Marks
Definition and characteristics of Industry 3.0 and Industry 4.0 - 2marks Explanation of key features of each revolution - 3 marks	5

Section 3 (Answer all question(s))

Marks CO BL
2 2 2

Q14. Explain the role of the Internet of Things (IoT) in Industry 4.0.

Rubric	Marks
Definition of IoT - 1 mark Explanation of its role in Industry 4.0 - 1mark	2

Q15. (a) Discuss how big data analytics enhances industrial automation.

8 2 3

Rubric	Marks
Definition of big data analytics - 2 marks Role in improving decision-making - 2 marks Role in predictive maintenance and optimization - 2 marks Examples of real-world industrial applications - 2 marks	8

(OR)

(b) Analyze the impact of AI and machine learning in predictive maintenance.

Rubric	Marks
Definition of predictive maintenance - 2 marks Explanation of AI and machine learning in predictive maintenance - 2 marks Benefits such as reduced downtime, cost savings, and efficiency - 2 marks Challenges and limitations - 2 marks	8

Section 4 (Answer all question(s))

Q16. Define collaborative robotics and explain its significance in Industry 4.0.

Marks CO BL

3 3 1

Rubric	Marks
Definition of collaborative robotics - 1 mark Key features and benefits - 2 marks	3

Q17. (a) Explain the role of sensing and perception technologies in smart factories.

7 3 2

Rubric	Marks
Definition of sensing and perception technologies - 2 marks Explanation of different types of sensors - 2 marks Role in automation and real-time monitoring - 3 marks	7

(OR)

(b) Analyze the benefits and challenges of human-robot interaction in manufacturing.

Rubric	Marks
Explanation of human-robot interaction - 2 marks Benefits such as efficiency, safety, and flexibility - 3 marks Challenges including technical, ethical, and safety concerns - 2 marks	7

Section 5 (Answer all question(s))

Q18. Define digital twin technology and explain its significance in Industry 4.0.

Marks CO BL

4 4 1

Rubric	Marks
Definition of Digital Twin - 1 mark Explanation of how it works - 1 mark Benefits such as simulation, optimization, and real-time monitoring - 2 marks	4

Q19. (a) Explain the importance of data security and privacy in Industry 4.0.

6 4 2

Rubric	Marks
Definition of data security and privacy - 2 marks	
Key threats in Industry 4.0 - 2 marks	
Importance of cybersecurity measures - 2 marks	6

(OR)

(b) Discuss cybersecurity challenges in smart factories and suggest possible solutions.

Rubric	Marks
Identification of major cybersecurity challenges - 2 marks	
Impact of these challenges on smart factories - 2 marks	6
Possible solutions and best practices - 2 marks	

Section 6 (Answer any 2 question(s))

Marks CO BL

Q20. Explain the role of smart logistics in Industry 4.0. How it enhances supply chain management?

5 5 2

Rubric	Marks
Definition of smart logistics - 1 mark	
Role of smart logistics in Industry 4.0 - 2 mark	5
Benefits in supply chain management - 2 mark	

Q21. Discuss predictive maintenance and how it helps in reducing downtime and improving efficiency in smart factories. 5 5 3

Rubric	Marks
Definition of predictive maintenance - 1 mark	
Role in Industry 4.0 - 2 marks	5
Key benefits such as cost savings and efficiency - 2 marks	

Q22. Evaluate the benefits and challenges of smart energy management in sustainable manufacturing.

5 5 5

Rubric	Marks
Definition of smart energy management - 1 mark	
Benefits such as energy savings and sustainability - 2 marks	5
Challenges including cost and integration issues - 2 marks	
