Q.5	i.	Describe how virtual and augmented reality are used in manufacturing processes.	**4**	2	1, 5	4	1		
	ii.	Design a basic framework to enhance data security in an Industry 4.0 setup. Justify your approach.	**6**	3	1, 4, 5	4	1		
OR	iii.	Using an example, implement a cybersecurity measure to protect a smart factory's network from potential cyberattacks. Describe the implementation process.	**6**	3	1, 2, 5, 12	4	1		
Q.6		Attempt any two:							
	i.	Explain the role of smart logistics in enhancing supply chain efficiency in Industry 4.0.	**5**		1, 2, 6, 12	5	1		
	ii.	Discuss the significance of predictive maintenance in reducing machine downtime in manufacturing systems.	**5**		1, 2, 5	5	1		
	iii.	Summarize the key components of smart energy management systems in a sustainable industrial setup.	**5**		1, 2, 7	5	1		

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
RA3EL06 Industry 4.0

Programme: B.Tech. Branch/Specialisation: RA

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	**BL**	**PO**	**CO**	**PSO**
Q.1	i.	Which industrial revolution introduced mass production using assembly lines? (a) Industry 1.0 (b) Industry 2.0 (c) Industry 3.0 (d) Industry 4.0	**1**	1	1	1	1
	ii.	Which is a key benefit of cyber-physical systems in smart factories? (a) Elimination of all human roles in production (b) Dependency on outdated manufacturing techniques (c) Increased collaboration between humans and machines (d) Lack of system flexibility	**1**	1	1	1	1
	iii.	Artificial Intelligence and Machine Learning are primarily used in Industry 4.0 for: (a) Streaming movies (b) Automating repetitive tasks and improving decision-making (c) Writing essays (d) Building physical infrastructure	**1**	1	1	2	1

iv.	What is the key advantage of using machine learning in Industry 4.0? (a) Real-time optimization and predictive modeling (b) Manual data entry (c) Fixed algorithms for all situations (d) Reduced need for software updates	**1**	1	1	2	1
v.	Which of the following technologies automates repetitive business processes? (a) Machine learning (b) Internet of Things (IoT) (c) Robotic Process Automation (RPA) (d) Augmented Reality (AR)	**1**	1	1	3	1
vi.	What is a key advantage of collaborative robots (cobots) over traditional industrial robots? (a) Higher speed and precision (b) Reduced cost of production (c) Ability to work safely alongside humans without extensive safety barriers (d) Increased power and payload capacity	**1**	1	1	3	1
vii.	How does Virtual Reality (VR) contribute to manufacturing? (a) By automating the production line (b) By creating immersive simulations for training and design (c) By improving cybersecurity protocols (d) By generating production schedules	**1**	1	1	4	1
viii.	What is a Digital Twin? (a) A physical replica of an object (b) A digital representation of a physical object or system (c) A 3D printed model of a product (d) An augmented reality	**1**	1	1	4	1
ix.	Which technology enables real-time tracking in smart logistics? (a) Blockchain (b) RFID and GPS (c) Virtual reality (d) Big data analytics	**1**	1	1	5	1

x.	Which of the following is NOT an advantage of predictive maintenance? (a) Reduced downtime (b) Lower maintenance costs (c) Increased unexpected breakdowns (d) Enhanced equipment lifespan	**1**	1	1	5	1
Q.2	i. Describe the concepts of 'Smart Factories' and their role in Industry 4.0.	**2**	2	1, 12	1	1
	ii. Illustrate the concept of smart factories and how they differ from traditional manufacturing systems.	**3**	2	1, 12	1	1
	iii. Explain the evolution of industrial revolutions, highlighting the differences between Industry 1.0, 2.0, 3.0, and 4.0.	**5**	2	1, 12	1	1
OR	iv. Discuss how Industry 4.0 influences robotics and automation technologies.	**5**	2	1, 12	1	1
Q.3	i. Explain how the Internet of Things (IoT) contributes to enhanced operational efficiency in industrial settings.	**2**	2	1, 2, 12	2	1, 2
	ii. Develop a case by your own to demonstrate how IoT sensors can be implemented in a manufacturing line to reduce downtime.	**8**	3	1, 2, 3, 5, 12	2	1
OR	iii. Apply the concept of cloud computing to design a framework for managing and analyzing production data in a smart factory.	**8**	3	1, 2, 3, 5, 12	2	1, 2
Q.4	i. Describe the role of sensing and perception technologies in enabling smart factories within Industry 4.0.	**3**	2	1, 5, 12	3	1, 2
	ii. Develop a case study to identify the role of sensing technologies in reducing downtime in smart factories.	**7**	3	1, 2, 5, 12	3	1, 2
OR	iii. Demonstrate how collaborative robots can be programmed to work alongside humans in a manufacturing line.	**7**	3	1, 2, 5, 12	3	1

Marking Scheme

RA3EL06 (T) Industry 4.O

Q.1	i	(b) Industry 2.0	**1**
	ii	(c) Increased collaboration between humans and machines	**1**
	iii	(b) Automating repetitive tasks and improving decision-making	**1**
	iv	(a) Real-time optimization and predictive modeling	**1**
	v	(c) Robotic Process Automation (RPA)	**1**
	vi	(c) Ability to work safely alongside humans without extensive safety barriers	**1**
	vii	(b) By creating immersive simulations for training and design	**1**
	viii	(b) A digital representation of a physical object or system	**1**
	ix	(b) RFID and GPS	**1**
	x	(c) Increased unexpected breakdowns	**1**
Q.2	(i)	Concept: 1 mark : Role: 1 mark	**2**
	(ii)	Concept: 1 mark : difference: 2 mark	**3**
	(iii)	Description of all industrial revolutions: 5 marks	**5**
OR	(iv)	Influences of industry 4.0 point wise: 5 marks	**5**
Q.3	(i)	IoT definition: 1 mark; Description: 1 mark	**2**
	(ii)	Case development: 4 marks; IoT sensor implementation: 4 marks	**8**
OR	(iii)	Definition: 2 marks; Design of framework: 6 marks	**8**
Q.4	(i)	Name of technologies: 1 mark; Role: 2 marks	**3**
	(ii)	Development of a case study: 5 marks; Role: 2 marks	**7**
OR	(iii)	Working of collaborative robots: 7 marks	**7**
Q.5	(i)	virtual and augmented reality: 2 marks ; Use: 2 marks	**4**
	(ii)	Design framework: 4 marks; Justification: 2 marks	**6**
OR	(iii)	example: 2 marks ; Implementation: 4 marks	**6**
Q.6			
	(i)	Point-wise role of smart logistics: 5 marks	**5**
	(ii)	predictive maintenance: 2 marks ; Significance: 3 marks	**5**
	(iii)	components of smart energy management systems: 5 marks	5

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P.T.O.