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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VII - THEORY EXAMINATION (2025 - 2026)

Subject: Smart Manufacturing

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- 1-a. Which of the following is not a primary component of a digital twin? (CO1, K1) 1
- (a) Sensors
 - (b) Analytics
 - (c) Visualization
 - (d) Robotics
- 1-b. What is the primary purpose of using digital twins in urban planning? (CO1, K1) 1
- (a) To create virtual reality cities
 - (b) To optimize traffic flow
 - (c) To build skyscrapers
 - (d) To design virtual amusement parks
- 1-c. What is the primary goal of a smart factory in manufacturing? (CO2, K1) 1
- (a) Increasing energy consumption
 - (b) Reducing customization
 - (c) Enhancing quality
 - (d) Minimizing workforce training
- 1-d. What is one of the key advantages of real-time data analytics in smart factories? (CO2, K1) 1
- (a) Increased production defects
 - (b) Delayed decision-making
 - (c) Improved quality control
 - (d) Reduced energy consumption

- 1-e. Which of the following is NOT a characteristic of CPS? (CO3, K1) 1
- (a) Real-time interaction
 - (b) Integration of computation and physical processes
 - (c) Decentralized control
 - (d) Stand-alone operation
- 1-f. In CPS, what does the term "closed-loop control" refer to? (CO3, K1) 1
- (a) A control system with no feedback
 - (b) A control system with feedback from the physical process
 - (c) A control system that operates in isolation
 - (d) A control system without cyber components
- 1-g. What is the concept of "predictive maintenance" in connected manufacturing? (CO4, K1) 1
- (a) Maintaining equipment only when it fails
 - (b) Proactively maintaining equipment based on data and analytics
 - (c) Ignoring equipment maintenance
 - (d) Randomly maintaining equipment
- 1-h. Which of the following is a potential challenge in adopting augmented reality (AR) in connected manufacturing? (CO4, K1) 1
- (a) Improved human-machine interaction
 - (b) Limited hardware and software compatibility
 - (c) Enhanced data accuracy
 - (d) Decreased employee training efficiency
- 1-i. Which of the following is a key component of cognitive systems? (CO5, K1) 1
- (a) Memory
 - (b) Processor speed
 - (c) Keyboard
 - (d) Monitor resolution
- 1-j. What is the role of cognitive systems in financial institutions? (CO5, K1) 1
- (a) Playing games with customers
 - (b) Automating customer service
 - (c) Enhancing fraud detection and risk assessment
 - (d) Organizing company picnics
2. Attempt all parts:-
- 2.a. What is a limitation of digital twins in healthcare? (CO1, K1) 2
- 2.b. What is the primary goal of a smart factory? (CO2, K1) 2
- 2.c. What are the potential benefits of CPS in agriculture? (CO3, K1) 2
- 2.d. Explain the role of human-machine collaboration in connected manufacturing. (CO4, K1) 2
- 2.e. What is the purpose of perception in cognitive systems? (CO5, K1) 2
- SECTION-B** 30

3. Attempt all parts:-
- 3.a. Answer any one of the following:-
- 3.a.(i) Explain the difference between a digital twin and a physical prototype in product development. (CO1, K2) 6
- 3.a.(ii) What are some of the common tools and software platforms used for creating and managing digital twins? (CO1, K2) 6
- 3.b. Answer any one of the following:-
- 3.b.(i) What are the main considerations when selecting an enterprise resource planning (ERP) system for a smart factory? (CO2, K2) 6
- 3.b.(ii) What role does artificial intelligence play in optimizing processes within a smart factory? (CO2, K2) 6
- 3.c. Answer any one of the following:-
- 3.c.(i) Explain the significance of "synchronization" in distributed Cyber-Physical Systems. Why is it essential for coordination and control? (CO3, K2) 6
- 3.c.(ii) What is the primary objective of CPS research and development in the context of smart cities? (CO3, K2) 6
- 3.d. Answer any one of the following:-
- 3.d.(i) Explain the concept of "smart sensors" and their significance in a connected manufacturing environment. (CO4, K2) 6
- 3.d.(ii) What are the advantages of using RFID technology for tracking and managing inventory in a connected manufacturing setting? (CO4, K2) 6
- 3.e. Answer any one of the following:-
- 3.e.(i) Explain the difference between supervised and unsupervised learning in cognitive systems. (CO5, K2) 6
- 3.e.(ii) What is the significance of cognitive systems in the context of accessibility and inclusivity? (CO5, K2) 6

SECTION-C 50

4. Answer any one of the following:-
- 4-a. What challenges are associated with the implementation of digital twins, and how can these challenges be addressed? (CO1, K2) 10
- 4-b. What is the significance of data security and privacy in the context of digital twins, and how can these concerns be mitigated? (CO1, K2) 10
5. Answer any one of the following:-
- 5-a. Describe the principles of green manufacturing and how they align with the objectives of a smart factory. What are the potential economic and environmental benefits? (CO2, K2) 10
- 5-b. What are the challenges associated with handling and analyzing large volumes of data in a smart factory, and how can they be addressed? (CO2, K2) 10
6. Answer any one of the following:-
- 6-a. What are the main challenges related to security and privacy in Cyber-Physical Systems, and why are they significant? (CO3, K2) 10
- 6-b. What is the connection between Industry 4.0 and Cyber-Physical Systems, and how 10

is CPS revolutionizing manufacturing processes? (CO3, K2)

7. Answer any one of the following:-

7-a. Describe the advantages of implementing a connected manufacturing system for a production facility. (CO4, K2) 10

7-b. What are the cybersecurity threats specific to connected manufacturing, and how can they be mitigated? (CO4, K2) 10

8. Answer any one of the following:-

8-a. Explain the concept of machine learning and its role in cognitive systems. (CO5, K2) 10

8-b. What are the potential limitations and challenges of integrating cognitive systems into business processes? (CO5, K2) 10

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