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

B.Tech

SEM: VIII - THEORY EXAMINATION (2025 - 2026)

Subject: Industry 4.0

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:-

- (1.1) Where is the compressed air stored before distribution in a pneumatic system? 1
 (CO1, K1)
- (a) Receiver tank
- (b) Control valve
- (c) Air actuator
- (d) Air cooler
- (1.2) What does the first number represent in a directional control valve notation like 5/2? (CO1, K1) 1
- (a) Number of switching positions
- (b) Number of ports
- (c) Number of normal positions
- (d) Number of spools
- (1.3) Which characteristic of robots refers to the ability to sense surroundings? (CO2, K1) 1
- (a) Movement
- (b) Energy
- (c) Sensing
- (d) Intelligence
- (1.4) What is the purpose of end effectors in robotics? (CO2, K1) 1
- (a) To sense the environment
- (b) To provide power to the robot
- (c) To control movement
- (d) To perform specific tasks like gripping

- (1.5) What is the primary focus of cybersecurity objectives? (CO3, K1) 1
- (a) Confidentiality
 - (b) Integrity
 - (c) Availability
 - (d) Complexity
- (1.6) What does PaaS provide to the consumer in cloud computing? (CO3, K1) 1
- (a) Deployment onto cloud infrastructure
 - (b) Control over underlying infrastructure
 - (c) Ready-to-use applications
 - (d) System monitoring tools
- (1.7) Which component is responsible for scheduling events in a discrete event simulation? (CO4, K1) 1
- (a) Event scheduler
 - (b) System state variables
 - (c) Input routines
 - (d) Trace routines
- (1.8) Which type of simulation is used for studying complex systems with discrete events? (CO4, K1) 1
- (a) Continuous simulation
 - (b) Trace-driven simulation
 - (c) Discrete event simulation
 - (d) Monte Carlo simulation
- (1.9) What is another term for Additive Manufacturing (AM)? (CO5, K1) 1
- (a) 3D printing
 - (b) CNC machining
 - (c) Injection molding
 - (d) Laser cutting
- (1.10) Which type of 3D printing technology uses liquid resin cured by UV light? (CO5, K1) 1
- (a) SLA
 - (b) FDM
 - (c) SLS
 - (d) DLP

2. Attempt all parts:-

- (2.1) Explain the differences between single-acting and double-acting hydraulic cylinders in terms of their construction and working. (CO1, K2) 2
- (2.2) Explain the concept of “payload” in relation to robot capabilities, including its meaning and significance in robotic performance. (CO2, K2) 2
- (2.3) Explain the difference between OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing) in the context of Big Data. (CO3, K2) 2
- (2.4) Explain why the exponential distribution is commonly used to model service times 2

- in queueing systems. (CO4, K2)
- (2.5) Explain the concept of reverse engineering and its purpose in engineering and product development. (CO5, K2) 2

SECTION-B 30

Answer any one of the following:-

- (3.1) Apply the concept of a Filter Regulator Lubricator (FRL) unit by explaining its functions and identifying its main components in pneumatic systems. (CO1, K3) 6
- (3.2) Apply pneumatic symbols to explain the design and function of pneumatic circuits. (CO1, K3) 6

Answer any one of the following:-

- (3.3) Analyze the role of sensors in robotic systems, highlighting different sensor types and their applications in perception and interaction with the environment. (CO2, K3) 6
- (3.4) Investigate the role of robotic joints (revolute and prismatic) in enabling specific types of robotic motions and applications. (CO2, K3) 6

Answer any one of the following:-

- (3.5) Analyze the concept of Big Data by examining the challenges associated with processing large and complex datasets, and differentiate how increasing dataset sizes impact data analysis. (CO3, K3) 6
- (3.6) Apply the concept of parallel processing in computing by illustrating different levels of parallelism and describing hardware and software approaches used to achieve parallel computing. (CO3, K3) 6

Answer any one of the following:-

- (3.7) Apply the concepts of simulation quality assurance by explaining the importance of verifying and validating simulation models and distinguishing between model verification and model validation. (CO4, K3) 6
- (3.8) Apply the concepts of discrete and continuous state models to illustrate their characteristics and demonstrate how they differ in simulation scenarios. (CO4, K3) 6

Answer any one of the following:-

- (3.9) Explain the design requirements and analysis processes involved in additive manufacturing, and compare how these differ from traditional manufacturing design approaches. (CO5, K3) 6
- (3.10) Explain the significance of design optimization in additive manufacturing. Discuss how design considerations such as part orientation and support structure placement affect print quality and efficiency. (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

- (4.1) Explain the significance of lubricants in pneumatic systems by describing the functions of an air lubricator and its role in maintaining the efficiency and longevity of pneumatic components. (CO1, K3) 10
- (4.2) Investigate the impact of fluid properties on the performance of hydraulic systems. 10

Discuss the effects of viscosity, temperature, and contamination on system efficiency and component longevity. (CO1, K4)

5. Answer any one of the following:-

- (5.1) Analyze the role of kinematics in robotic manipulators by examining forward and inverse kinematics and their significance in motion planning and control. (CO2, K4) 10
- (5.2) Examine the impact of gripper design on object handling and manipulation in industrial automation, evaluating factors such as reliability, adaptability, and efficiency. (CO2, K4) 10

6. Answer any one of the following:-

- (6.1) Discuss the challenges associated with Big Data processing. Explain the concept of the 5 V's in Big Data analysis and how they impact decision-making in organizations. (CO3, K4) 10
- (6.2) Describe the role of web services in enabling interoperability and accessibility for a Software as a Service (SaaS) application. Provide examples of designing web-based interfaces to ensure usability across various devices. (CO3, K3) 10

7. Answer any one of the following:-

- (7.1) Compare and contrast different types of simulation models, including continuous time models and discrete time models. Provide real-world examples where each type of model would be most effective. (CO4, K4) 10
- (7.2) Analyze the advantages of using discrete event simulation in practical scenarios by examining its key components such as event scheduling, system state variables, event routines, and simulation outputs, using a real-world application as an example. (CO4, K4) 10

8. Answer any one of the following:-

- (8.1) Compare and contrast the operational principles, material properties, and applications of Fused Filament Fabrication (FFF) and Stereolithography (SLA) technologies in additive manufacturing. (CO5, K4) 10
- (8.2) Analyze the impact of support structures on FDM printing. How do support structures affect print orientation, material usage, and overall production efficiency in AM? (CO5, K4) 10