Printed Page:-04 **Subject Code**:- **AOE0867**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: VIII - THEORY EXAMINATION (2023 - 2024)

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-a. Where is the compressed air stored before distribution in a pneumatic system? (CO1) 1

(a) Receiver tank

(b) Control valve

(c) Air actuator

(d) Air cooler

1-b. Which component provides lubrication for pneumatic components? (CO1) 1

(a) Air filter

(b) Pressure regulator

(c) Lubricator

(d) Compressor

1-c. In which industry are industrial robots commonly used? (CO2) 1

(a) Automotive

(b) Food and beverage

(c) Entertainment

(d) Construction

1-d. Which type of robot is used for bomb disposal and reconnaissance? (CO2) 1

(a) Mobile robots

(b) Industrial robots

(c) Domestic robots

(d) Medical robots

1-e. Which deployment model limits access to cloud resources to a specific organization? (CO3) 1

(a) Public Cloud

(b) Private Cloud

(c) Community Cloud

(d) Hybrid Cloud

1-f. What does PaaS provide to consumers in cloud computing? (CO3)

(a) Deployment of consumer-created applications

(b) Control over underlying infrastructure

(c) Ready-to-use software 1

(d) System monitoring capabilities

1-g. How is the Cumulative Distribution Function (CDF) defined for a continuous random variable? (CO4) 1

(a) $F(x) = P(X \leq x)$

(b) $F(x) = \int_{-\infty}^{x} f(t)dt$

(c) $F(x) = \sum_{\xi \leq x} p(\xi)$

(d) $F(x)$ is the integral of $f(x)$ from $-\infty$ to x

1-h. How is the probability calculated for a continuous random variable X lying in the interval [a, b]? (CO4) 1

(a) $P(a \leq X \leq b) = \int_{a}^{b} f(x)dx$

(b) $P(a \leq X \leq b) = P(a < X \leq b)$

(c) $P(a \leq X < b) = P(a < X < b)$

(d) $P(X=x) = 0$ for all x in Rx

1-i. Which industry extensively uses additive manufacturing for rapid prototyping? (CO5) 1

(a) Automotive

(b) Agriculture

(c) Hospitality

(d) Retail

1-j. What is the role of support structures in FDM printing? (CO5) 1

(a) To provide stability during printing

(b) To color the print

(c) To remove excess material

(d) To heat the filament

2. Attempt all parts:-

2.a. What is the significance of a Filter Regulator Lubricator (FRL) unit in compressed air systems? (CO1) 2

2.b. Describe the primary components of a robot manipulator. (CO2) 2

2.c. Explain the concept of unstructured data and provide examples of sources that generate unstructured data. (CO3) 2

2.d. Define the expected value (mean) of a continuous random variable and explain how it is calculated. (CO4) 2

2.e. Discuss the applications of reverse engineering in the automotive industry. (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Explain the process of converting mechanical energy into hydraulic energy using pumps. (CO1) 6

3-b. Discuss the role of non-return valves and flow control valves in hydraulic circuits. (CO1) 6

3-c. Investigate the role of robotic joints (revolute and prismatic) in enabling specific types of robotic motions and applications. (CO2) 6

3-d. Discuss the ethical considerations and societal impacts of robotics, particularly in terms of job displacement and human-robot interaction. (CO2) 6

3.e. Explain the concept of parallel processing in computing. Describe different levels of parallelism and hardware/software approaches used to achieve parallel computing. (CO3) 6

3.f. Define and elaborate on the characteristics of a discrete state model in simulation. How does a discrete state model differ from a continuous state model? (CO4) 6

3.g. Compare the material properties of PLA and ABS used in Fused Filament Fabrication (FFF). How do these materials impact the strength, flexibility, and print quality of FFF parts? (CO5) 6

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Investigate the impact of fluid properties on the performance of hydraulic systems. Discuss the effects of viscosity, temperature, and contamination on system efficiency and component longevity. (CO1) 10

4-b. Create a step-by-step guide to assembling a basic pneumatic control system using directional control valves and actuators. (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a. Evaluate the efficiency and effectiveness of SCARA robots in assembly line operations, highlighting advantages in speed, precision, and versatility. (CO2) 10

5-b. Design a simulation scenario to optimize robotic performance in complex manufacturing tasks, considering cycle time, efficiency metrics, and quality control standards. (CO2) 10

6. Answer any <u>one</u> of the following:-

6-a. Discuss the characteristics and benefits of System as a Service (SaaS) in cloud computing. How does SaaS abstract infrastructure complexities and streamline application delivery? (CO3) 10

6-b. Discuss the main benefits of leveraging parallel computing in cloud environments. How does parallel computing enhance system performance, scalability, and resource utilization? (CO3) 10

7. Answer any <u>one</u> of the following:-

7-a. 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) 10

7-b. Create a detailed simulation model for a discrete event system, such as a traffic intersection. Define the system's state variables, events, and event routines. Describe how you would schedule and manage events using an event-driven approach. Explain the simulation clock mechanism and initialization routines. (CO4) 10

8. Answer any <u>one</u> of the following:-

8-a. Critically assess the significance of design optimization in additive manufacturing. Provide examples of design strategies and computational tools used to enhance part performance and manufacturability. (CO5) 10

8-b. Discuss the future trends and challenges of additive manufacturing technologies. How might advancements in materials science, automation, and post-processing techniques shape the future of AM? (CO5) 10