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. What is the primary purpose of air filters in a pneumatic system? (CO1) 1

(a) To remove contaminants from compressed air
(b) To increase the temperature of compressed air
(c) To reduce the volume of compressed air
(d) To lubricate pneumatic components

1-b. What converts electrical energy into mechanical energy to drive the compressor? (CO1) 1

(a) Air cooler
(b) Receiver tank
(c) Electric motor
(d) Control valve

1-c. What do domestic robots like robotic vacuum cleaners primarily belong to? (CO2) 1

(a) Industrial robots
(b) Medical robots
(c) Household robots
(d) Service robots

1-d. What type of control unit does a pick-and-place robot typically use? (CO2) 1

(a) Continuous-path control unit
(b) Point-to-point control unit

(c) Servo system

(d) Open-loop control unit

1-e. What is the main benefit of load balancing in cloud computing? (CO3) 1

(a) Improve resource utilization

(b) Reduce initial investment

(c) Enhance system security

(d) Increase data storage

1-f. Which type of parallelism involves executing multiple tasks at the same time? (CO3) 1

(a) Bit level parallelism

(b) Instruction level parallelism

(c) Data level parallelism

(d) Task level parallelism

1-g. Which type of model defines state variables as continuous? (CO4) 1

(a) Discrete state model

(b) Continuous state model

(c) Continuous time model

(d) Discrete event model

1-h. Which component is essential in a discrete event simulation system? (CO4) 1

(a) Event scheduler

(b) Dynamic memory management

(c) Report generator

(d) Initialization routines

1-i. What is a key consideration when designing for additive manufacturing? (CO5) 1

(a) Complexity

(b) Cost-effectiveness

(c) Material waste

(d) Assembly time

1-j. What is the purpose of slicing software in Stereolithography (SLA) technology? (CO5) 1

(a) To convert 3D models into printable layers

(b) To heat the resin before printing

(c) To control extruder temperature

(d) To clean the printing bed

2. Attempt all parts:-

2.a. Why is it essential to use a dryer in a pneumatic system? (CO1) 2

2.b. What is the definition of a robot according to the information provided? (CO2) 2

2.c. What are the key characteristics of structured data? Provide examples of sources 2

	that generate structured data. (CO3)	
2.d.	Explain the purpose of an event scheduler in discrete event simulations. (CO4)	2
2.e.	Discuss the importance of material preparation and precautions in LDM technology. (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Describe the working principle and applications of double-acting hydraulic cylinders. (CO1)	6
3-b.	Explain the operation and applications of solenoid-actuated directional control valves. (CO1)	6
3-c.	Investigate the factors influencing a robot's payload and reach capabilities, and how these factors affect robot design and operation. (CO2)	6
3-d.	Discuss the significance of kinematics in controlling and predicting robot movements, including forward and inverse kinematics. (CO2)	6
3.e.	Compare and contrast Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) in cloud computing. Provide examples of each service model and discuss their respective advantages and use cases. (CO3)	6
3.f.	Explain the importance of verifying and validating simulation models. Discuss the differences between model verification and model validation. (CO4)	6
3.g.	Discuss the career prospects and skill sets required for professionals pursuing a career in additive manufacturing. How has the demand for these skills evolved in recent years? (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain the working principles and advantages of using a 3/2 directional control valve in a pneumatic circuit. Provide a detailed illustration of how this valve controls a single-acting cylinder. (CO1)	10
4-b.	Design a pneumatic circuit diagram using standard pneumatic symbols to control the motion of a double-acting cylinder. Include air filters, regulators, lubricators, and directional control valves in your design. (CO1)	10

5. Answer any one of the following:-

5-a.	Compare and contrast mobile robots and industrial robots, emphasizing their design considerations, typical applications, and impact on automation efficiency. (CO2)	10
5-b.	Examine the ethical considerations and challenges associated with integrating robots into medical environments, focusing on patient safety, surgical accuracy, and ethical decision-making processes. (CO2)	10

6. Answer any one of the following:-

6-a.	Describe the role of load balancing in cloud computing environments. How does load balancing optimize resource utilization and enhance system performance?	10

(CO3)

6-b. Explain the cybersecurity objectives of confidentiality, integrity, and availability. Discuss the measures and technologies used to achieve these objectives in modern IT systems. (CO3) 10

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

7-a. Discuss the potential consequences of using inappropriate random number generators and seeds in simulation. How can the selection of proper randomization techniques impact the validity of simulation outcomes? (CO4) 10

7-b. Investigate the advantages and disadvantages of Monte Carlo Simulation and Trace-Driven Simulation. Compare these simulation methods in terms of credibility, validation, workload representation, and complexity of implementation. CO4) 10

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

8-a. Develop a comprehensive business plan outlining the potential applications and market opportunities for additive manufacturing technologies in a specific industry of your choice. Include strategies for product development, production scaling, and market penetration. (CO5) 10

8-b. Lead a research project on material innovation in additive manufacturing. Investigate emerging materials such as biodegradable polymers, metal alloys, and advanced composites for AM applications. Evaluate material properties, process compatibility, and potential industry disruptions. (CO5) 10