

B.I.E.E Third Year Second Semester Examination 2025Time: **3 hours** Subject: **Industrial Automation Systems** Full Marks: **100**

- Each module is associated with a course outcome.
- Answer all modules.
- Choices, if provided, are limited to questions within a module.

Module A: Answer any Three.

Coverage: Course Outcome 1

Question	Marks
1. What are the main components of a modular PLC? Briefly describe the function of each component.	10
2. a) What is a redundant PLC system? What are its advantages? b) Differentiate between the following redundant PLC configurations: (i) Hot standby, (ii) Warm standby and (iii) Cold standby.	5 5
3. What is a "Scan cycle" in a PLC? List the main steps executed in each scan cycle. What is a "process image", in this context?	10
4. What does the IEC 61131-3 standard cover? List the programming languages defined in this standard. Are they graphical or text-based? Briefly explain the concept of "Tasks" as specified in this standard.	10

Module B: Answer all questions.

Coverage: Course Outcome 2

5. What is the difference between a single-acting and a double-acting linear pneumatic actuator? List the advantages and disadvantages of each.	10
6. a) What is a pneumatic directional control valve (DCV)?	4
b) What do the terms "Ports" and "Ways" signify in the context of a DCV?	3
c) How are directional control valves actuated?	4

[Turn over

Question	Marks
Module C: Answer all questions. Coverage: Course Outcome 3	
7. Briefly explain the architecture of a typical Distributed Control System.	10
8. What does the term 'Automation Pyramid' signify? State the role of each level in the pyramid.	7
Module D: Answer all questions. Coverage: Course Outcome 4	
9. Briefly describe the following: (attempt any TWO). a) Enclosure classification. b) Intrinsic safety interface. c) Temperature classification of equipment used in hazardous atmospheres.	7 × 2
10. Explain how either the Exp or Exd (any ONE) protection technique helps prevent explosions caused by electrical equipment in hazardous areas. Also, state the Zone(s) where the selected technique can be used.	4 + 2
11. Differentiate between: (attempt any THREE). a) LEL and UEL. b) Zone 2 and Zone 20. c) Hazardous area and Safe area. d) Minimum ignition energy and the most easily ignited concentration. e) Simple apparatus and Intrinsically safe apparatus.	4 × 3