Time: 3 Hours   **Total Marks: 80**

Note: 1) Question No.1 is **Compulsory**
       2) Attempt any three questions out of the remaining five questions.
       3) Figures to the right indicate full marks.
       4) Assume suitable data wherever required.

Q1	**Attempt any four**	**(20)**
A.	Explain the impact of automation on productivity and cost in manufacturing systems.	
B.	What is the difference between uninformed and informed search algorithms? Explain with examples.	
C.	What are the basic components of an Artificial Neural Network? List and explain briefly.	
D.	Define a point-to-point control system used in the robotic system with suitable applications.	
E.	What is latching in PLC programming? Draw a ladder diagram to demonstrate latching using a push button.	

Q2 A	Design simple pneumatic circuit for two-cylinder operation with the following sequence using 4/2 pilot-operated valve as DCV using cascade method Delay B+ A+ A- B-, With user option of single cycle – multi cycle. Also draw displacement diagram.	**(10)**
B	Compare supervised learning with unsupervised learning. Discuss their major differences in data labelling, model training, and algorithm use.	**(10)**

Q3 A	What is meant by agent and explain its types with reference to Artificial Intelligence. (include sketches)	**(10)**
B	Illustrate with neat sketches mechanical and magnetic type of end effectors used in robotic system, stating its advantages and disadvantages.	**(10)**

Q4 A	Compare BFS and DFS based on the following parameters: i) Approach (Strategy), ii) Data structure used, iii) Time complexity, iv) Space complexity, v) Completeness and optimality	**(10)**
B	Illustrate with neat sketch hydraulic intensifier circuits.	**(10)**

Q5 A	Design electro-pneumatic circuit for two-cylinder operation with the following sequence using 5/2 both side solenoid-operated valve as DCV. A+B+Delay B- A- , With user selection option single cycle Multicycle operation.	**(10)**
B	How do pitch, yaw, and roll relate to the degrees of freedom in a robot? Explain with examples.	**(05)**
C	Illustrate with neat sketches, the logic of AND and OR gates, used in operation of pneumatic circuits.	**(05)**

Q6 A	Define Natural Language Processing (NLP). Explain its role and applications in industrial automation.	**(10)**
B	Differentiate between PLC and Relays.	**(05)**
C	Illustrate K nearest neighbours algorithm used in machine learning.	**(05)**