Industrial Automation & Robotics
(PE-408, Dec-07)

Note: Section A is compulsory. Attempt any four questions from Section B and any two from Section C.

Section-A

1. a) Sketch the standard symbol for
   (i) a pneumatic motor.
   (ii) any 4/2 direction control solenoid operates valve
   (iii) a pneumatic pressure regulator valve
   (iv) double acting pneumatic cylinder.
   b) What do you understand by the term 'tactile sensors'?
   c) Mention two significant differences between a microprocessor and a programmable logic controller.
   d) Write a brief note on spray painting robots.
   e) Briefly explain whether pneumatics and PLCs can be used for low cost automation.
   f) Explain NAND gate and NOR gate.
   g) Using a truth table show that $\overline{A.B} = \overline{A} + \overline{B}$.
   h) Why were ladder diagrams used for programming PLC systems?
   i) What do you understand by 'slip sensors' for robotic grippers?
   j) What are the main functions of the A register in a microprocessor?

Section-B

2. What kind of fluid systems requires the use of positive displacement motor? How is pressure regulated in such systems?
3. (a) Write a Boolean expression for the following truth table. Can the Boolean expression be simplified?

Input A	Input B	Input C
0	0	1
0	1	0
1	0	1
1	1	0

   Implement the above Boolean expression using standard symbols of logic gates.
4. Discuss the use of any feeder device for picking and orienting operations.
5. What are ports in a microprocessor system? Explain the difference between accessing ports and memory?
6. What are programmable logic controllers? Discuss the applications for which these are used. Discuss three significant advantages and disadvantages.

Section-C

7. With the help of neat sketches, explain the working of
   (a) vane pump (ii) check valve
8. (a) Draw the schematic of a hydraulic circuit for the following sequence: Extend a cylinder, provide a dwell and then retract the cylinder.
   (b) How is robotic vision sensed? What are the component systems used in most common vision based applications?
   (i) A pneumatic circuit is to be designed for the following sequence.
      (a) Clamping a job and maintaining its position while machining.
      (b) Moving the tool for machining
      (c) Returning the tool
      (d) Unclamping the job
   Sketch the movement diagram.
   (ii) Draw and explain the complete circuit for part (i)
9. (a) Explain a fluidic NOR gate using a neat sketch.
   (b) Classify robots based on their geometry. Explain the application pertaining to each class.