Industrial Automation and Robotics
(PE-408, MAY 2007)

Time: 3 Hrs
Max Marks: 60

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

Section-A

1. a) Classify robots based on their geometry.
   b) List basic types of hydraulic control circuits.
   c) What is the work envelope of a robot?
   d) What do you understand by degree of freedom of a robot?
   e) Draw standard graphical symbol for a 4 way pilot operated spring centered hydraulic directional control valve.
   f) What is a programmable logic controller (PLC)?
   g) Classify feeders.
   h) Sketch double acting cushioned hydraulic cylinder and label the components.
   i) Sketch bleed-of circuit.
   j) What is a teach pendent?

Section-B

2. Show constructional details of a variable capacity axial- piston pump, label its components and explain its working. Give standard graphical symbol for such a device.
3. Draw double-handed pneumatic safety circuit for clamping and explain its working. Compare this circuit a single-handed circuit for the same purpose.
4. Discuss the construction and working of the following fluidic components:
   i) OR/NOR
   ii) Proximity detector (any one type)
5. What are the different configurations of robots? Which of these would be most suitable and why for the following:
   a) Placing a component in a CNC machine tool.
   b) Pecking part from a moving conveyor.
   c) Inserting a peg into a hole.

6. Write a brief note on low cost automation.

Section-C

7. Discuss step wise procedure for design of pneumatic logic circuit for given sequence of operation. Illustrate the procedure by taking any simple example.
8. With neat and labeled sketches, explain the working of the following feeders.
   a) Disk-pocket type feeder with in-built safety mechanism.
   b) Gate type feeder

9. Discuss VAL programming of robot for trajectory control operation.