

Q.P. Code : 6423

(3 Hours)

[Total Marks : 80

- N.B.:** 1) Question No.1 is compulsory.
2) Attempt **any three** questions out of remaining five questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

- Q.1** Solve any four (20)
- (a) With a neat block diagram explain the architecture of a mechatronics system.
 - (b) Distinguish between pneumatic, hydraulic and electrical actuators with its applications.
 - (c) Describe the principle of operation of a D.C. motor.
 - (d) Explain Autonomous Mobile Robot with its applications.
 - (e) With a neat sketch explain working principle of comb drive actuator.
 - (f) What is the difference between parallel and series interface.
- Q.2**
- (a) How heat dissipation in DC motor is influenced by velocity profile and coupling ratio. (8)
 - (b) Two double acting cylinders A and B are selected for an industrial application. Draw electro pneumatic circuit for the sequence of operation (A+B+B- delay A-) using 4/3 way double solenoid as the final directional control valve. (12)
- Q.3:**
- (a) Describe possible speed control strategies of A.C. Induction motors (10)
 - (b) With neat sketch explain the constructional feature and working of relief valve used in hydraulic system (5)
 - (c) Explain in brief various elements of CNC machine. (5)
- Q.4:**
- (a) Explain Universal Asynchronous Receiver and Transmitter (UART). (4)
 - (b) With neat diagram illustrate the working of Filter-Regulator-Lubricator (FRL) unit in a pneumatic system. (4)
 - (c) Explain the working principle of stepper motor and describe its various types along with its applications. (12)
- Q.5**
- (a) Explain data acquisition system and supervisory control and data acquisition (SCADA). (8)

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- (b) Two double acting cylinders A and B are selected for industrial automation. The motion of sequence $(AB)+ B+ A-$ (12)
 Draw Pneumatic circuit diagram and step displacement diagram. Select 5/2 way final directional control valves. Note that Cylinders A and B are moving simultaneously for the forward stroke.

- Q.6 (a) Explain impedance matching for a part of electromechanical system that consists of transmission of power using motor-gear drive system. (8)
- (b) A fluid mixer is used to mix two fluids with a vibrating machine, as per the machine sketch shown in Figure 1. The vibration machine is operated by a double acting pneumatic cylinder. The double acting cylinder is extended initially and when a pushbutton is pressed, the mixer mounted on a vibrating table moves down completely by retracting the cylinder and then executes an up and down motion between the retracted position and the center position of the cylinder. The vibrating time is adjusted for 10s; after that the cylinder is switched OFF automatically. Three electrical limit switches, one at the center of cylinder position and other two at end positions, are used to control the strokes. Draw PLC ladder diagram to achieve the above sequence of operation. (12)

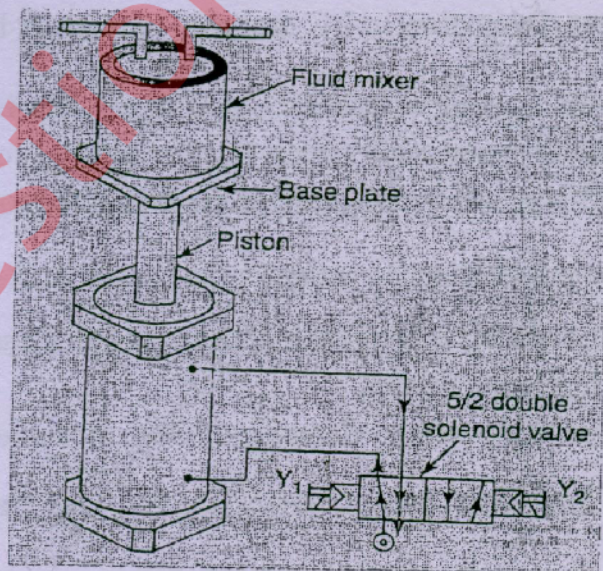


Figure 1