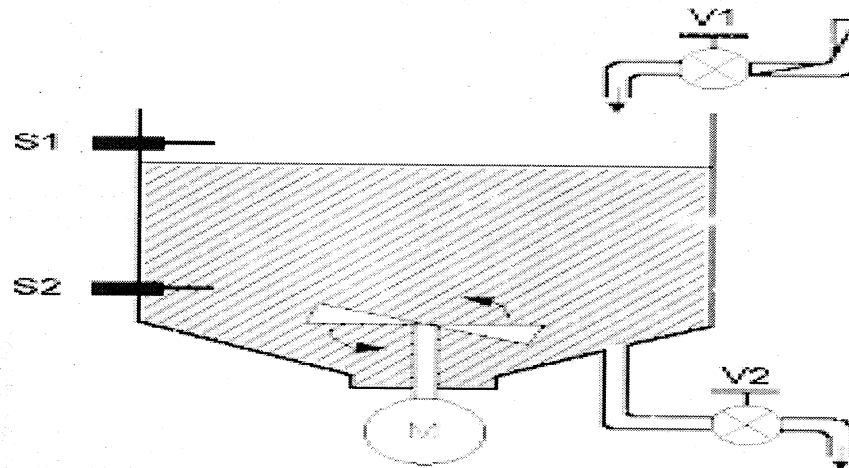


## Instructions:

1. **Question 1 compulsory.**
2. Attempt any **three** questions from the remaining **five** questions.
3. Assume suitable data, **if necessary.**
4. **Figures/sketches** carry weightage.

- Q1)** Explain the following [ Any four] 20
- 1) Key elements of Mechatronics
  - 2) Piezoelectric cantilever beam
  - 3) Parameters to be considered for selection of an actuator
  - 4) Polling and Handshaking
  - 5) Buffers
- Q2)** a) Explain the FRL unit with a neat sketch 07
- b) Explain the features of Servo Amplifiers 07
- c) Explain working principle of Comb Drives with application 06
- Q3)** a) Explain the following 10
- i) Inertia Matching ii) Meter In Circuit
- b) Two double acting pneumatic cylinders are selected for an industrial application ;The sequence of the movement is as given below:- 10
- A+B+/A-B-
- Draw a pneumatic circuit
- Q4)** a) Explain the following: 10
- i) SCADA ii) Voice coil Actuator
- b) Explain with a block diagram the concept of washing machine as a mechatronic product 10
- Q5)** a) Two double acting pneumatic cylinders are selected for an industrial application ;The sequence of the movement is as given below:- 10
- (A +, B-), Delay (A-B+)
- Draw electro pneumatic circuit using 5/2 DC valve which is double solenoid operated using single cycle operation and also sketch the displacement diagram
- b) Explain: 10
- i) Universal Asynchronous Receiver and Transmitter ii) velocity profile optimization in DC Motor

- Q6) a) Explain the constructional features and working of an Autonomous Robot with a neat sketch 10
- Q6) b) A process tank shown in the figure below is used to mix a chemical according to the following sequence of operation 10
- A start button is pressed to start the operation and V1 is being operated with solenoid SO1, in order to fill the tank to preset level sensed by level switch S1.
  - As the tank fills level switch S1 closes NO contact to energize the stirrer motor M to start automatically and operate for 60 seconds to mix the chemical.
  - When the stirrer motor stops, the solenoid SO2 operates valve V2 to energize to empty the tank.
  - When the tank is empty Level switch S2 de energizes solenoid operated valve S2
  - A stop button is pressed to stop the operation.



Draw PLC ladder diagram

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