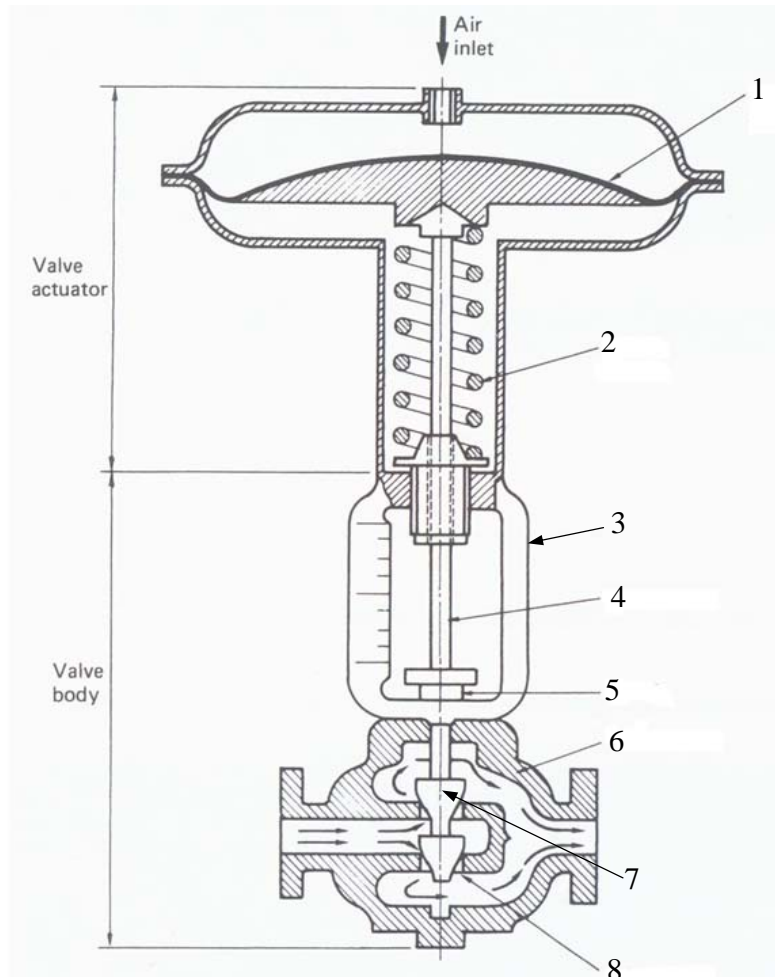


Tutorial 5

Chapter 12 Actuators

12.1 Draw a block diagram of a feedback control system with four basic components. Label all variables/signals within it. Allocate where the actuator is.

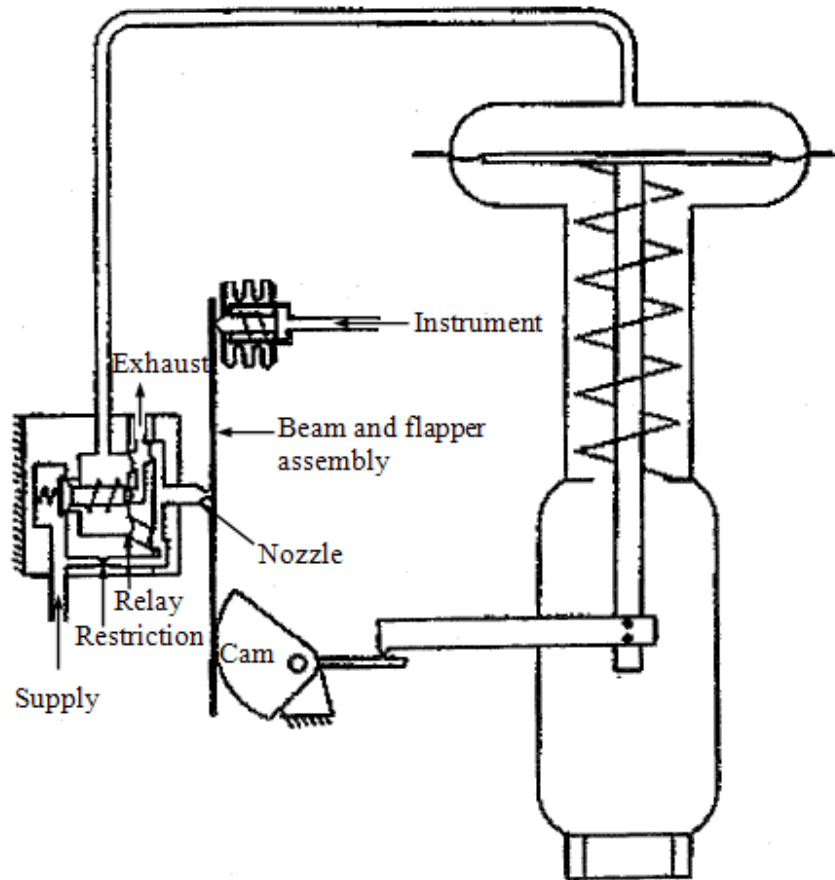
12.2 The following figure shows a pneumatic diaphragm valve with some numbered items.



- (a) Label the numbered items.
- (b) Describe the operating principle of the valve. What safe mode is the valve?
- (c) Explain with the aid of simple sketches how this valve is used and installed in a piping system to control the flow.

12.3 Explain, with the aid of simple sketches, the meaning of “fail safe open” and “fail safe shut”.

12.4 The following figure shows a pneumatic valve positioner. Describe its operating principle.



12.5 State 3 advantages and 3 disadvantages of using a valve positioner.

12.6 Explain with the aid of sketches and formulae the relationship between the control pressure and output flow rate of a pneumatic diaphragm control valve.

12.7 Explain with the aid of sketches and formulae the following valve flow characteristics:

- (i) Quick-opening
- (ii) Linear
- (iii) Equal-percentage

12.8 Describe a spool valve.

12.9 Describe a flapper valve

12.10 Describe a two-stage electro-hydraulic servo-valve (a jet-pipe valve)

12.11 Prove with the aid of simple sketches and formulae that a hydraulic servo-valve cylinder is of an integral controller

12.12 Describe operating principle of an electro-hydraulic actuator. Take examples of applications of electro-hydraulic actuators in marine and offshore system.

12.13 Describe with the aid of sketches a solenoid valve.

12.14 Explain the operating principle of a linear motor.

12.15 How many types of DC motor are there? Explain the operating principles of DC motors.

12.16 Explain with the aid of sketches field-controlled DC motors.

12.17 Explain with the aid of sketches armature-controlled DC motors.

12.18 How many types of AC motor are there? Explain the operating principles of AC motors.

12.19 Describe the operating principle of a brushless DC motor.

12.20 Describe the operating principle of a stepper motor.

12.21 Describe with the aid of simple sketches an electrical motor valve actuator.