

EMTR-2019
Assignment #2

Due: 8:00PM, Feb. 10, 2026

Q1. Problem 7.12

What is the process control valve size required for a valve that is required to control the flow of water when the maximum flow required is $0.002 \text{ m}^3/\text{s}$ and the permissible pressure drop across the valve at this flow rate is 100 kPa ? The density of water is $1000 \text{ kg}/\text{m}^3$.

Q2. Problem 8.3

By examining the following mechanisms, state the number of degrees of freedom each has.

- (a) A car hood hinge mechanism.
- (b) An estate car tailgate mechanism.
- (c) A windscreen wiper mechanism.
- (d) Your knee.
- (e) Your ankle.

Q3. Problem 8.5

For the mechanism shown in Figure 6.31, the arm AB rotates at a constant rate. B and F are sliders moving along CD and AF. Describe the behaviour of this mechanism.

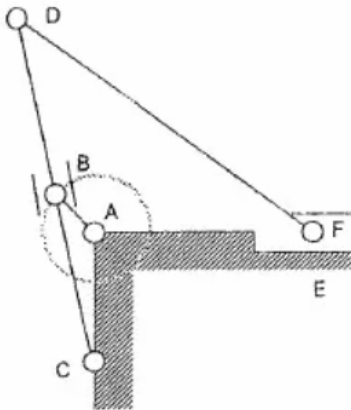


Fig. 6.31 Problem 5

Q4. Problem 8.6

Describe how the displacement of the cam follower shown in Figure 6.32 will vary with the angle of rotation of the cam.

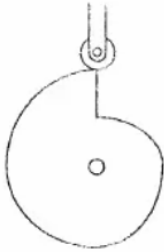


Fig. 6.32 Problem 6

Q5. Problem 8.9

Design a mechanical system which can be used to:

- Operate a sequence of microswitches in a timed sequence.
- Move a tool at a steady rate in one direction and then quickly move it back to the beginning of the path
- Transform a rotation into a linear back-and-forth movement with simple harmonic motion.
- Transform a rotation through some angle into a linear displacement.
- Transform a rotation of a shaft into rotation of another, parallel shaft some distance away.
- Transform a rotation of one shaft into rotation of another, close shaft which is at right angles to it.

Q6. Problem 8.10

A compound gear train consists of the final driven wheel with 15 teeth which meshes with a second wheel with 90 teeth. On the same shaft as the second wheel is a wheel with 15 teeth. This meshes with a fourth wheel, the first driver, with 60 teeth. What is the overall gear ratio?

If the transmitted power is 2 kW and the input shaft rotates at 1200 rpm, what is the torque transmitted by each gear, and speed in rpm of each gear (assume no friction power loss)?