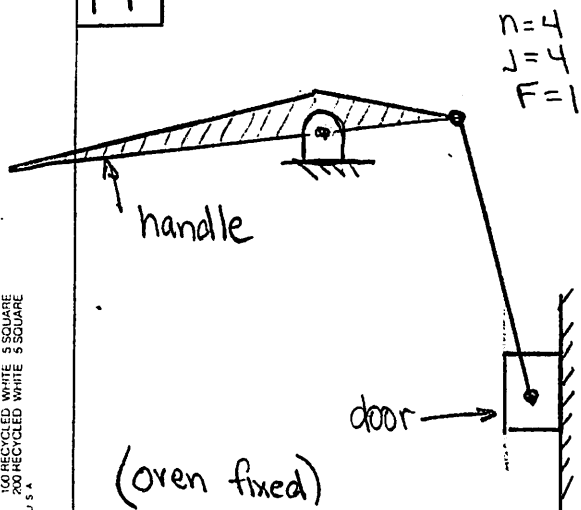
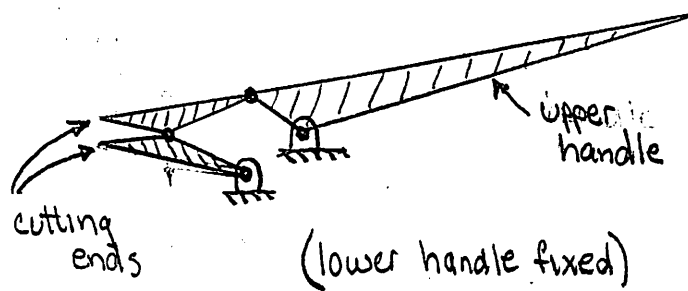


CHAPTER 1

1-1



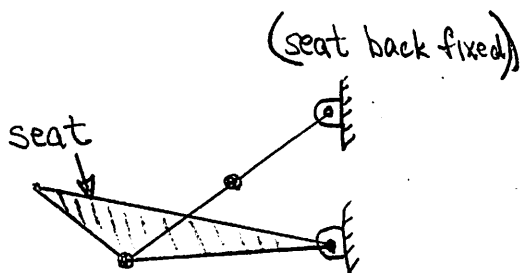
1-2



$n=4, J=4, F=1$

1-3

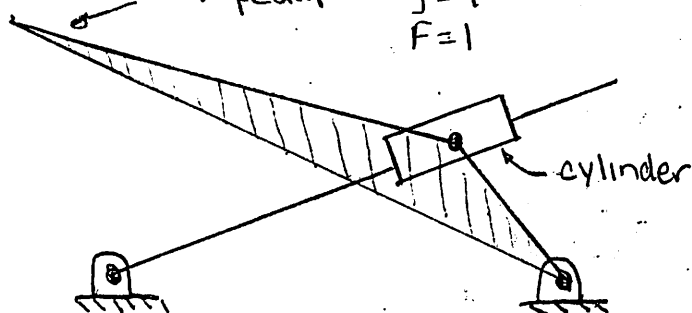
$n=4, J=4, F=1$



1-4

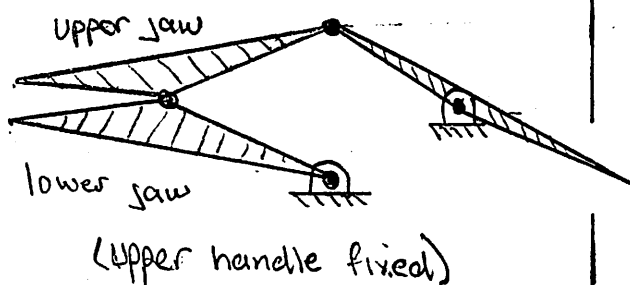
foot pedal

$n=4$
 $J=4$
 $F=1$



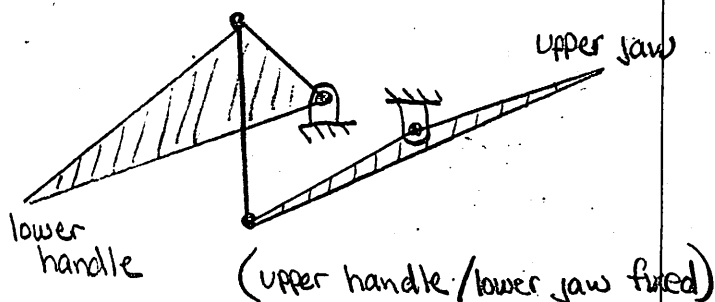
1-5

$n=4, J=4, F=1$



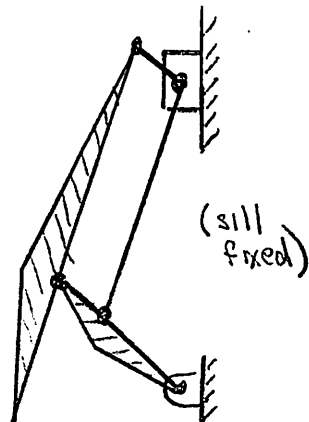
1-6

$n=4, J=4, F=1$



1-7

$n=6$
 $J=7$
 $F=1$

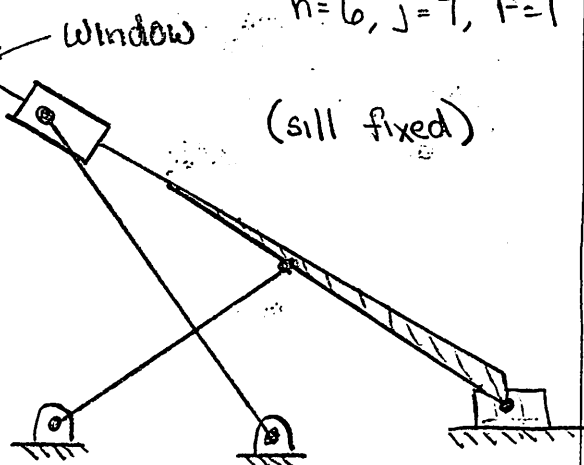


1-8

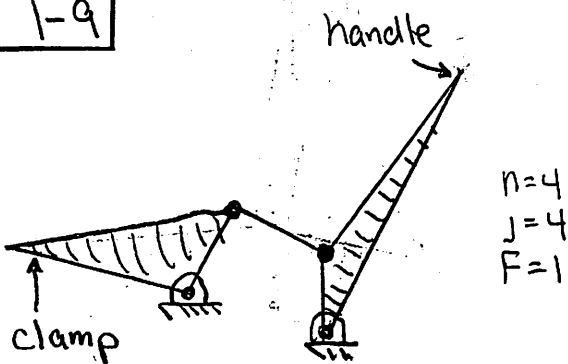
window

$n=6, J=7, F=1$

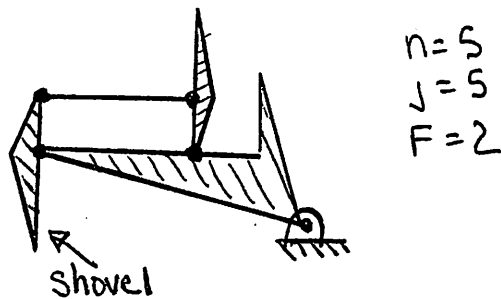
(sill fixed)



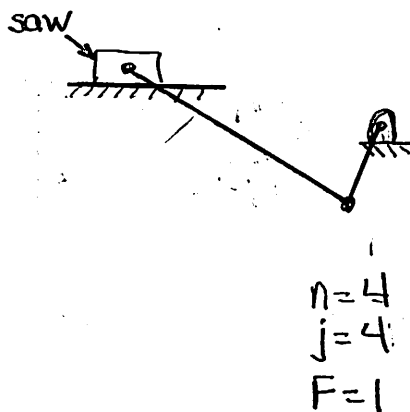
1-9



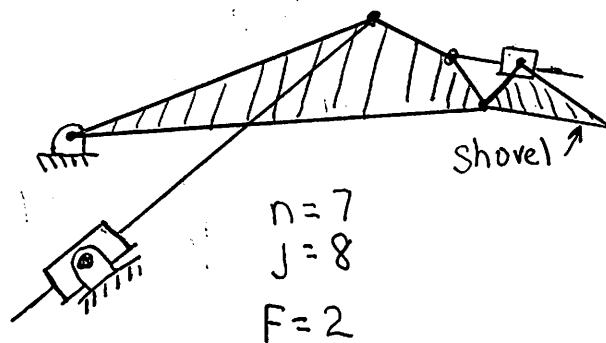
1-10



1-11

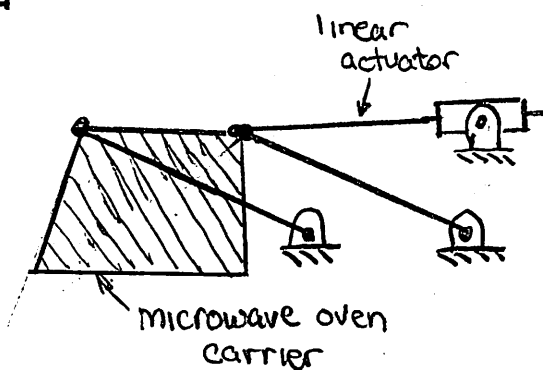


1-12



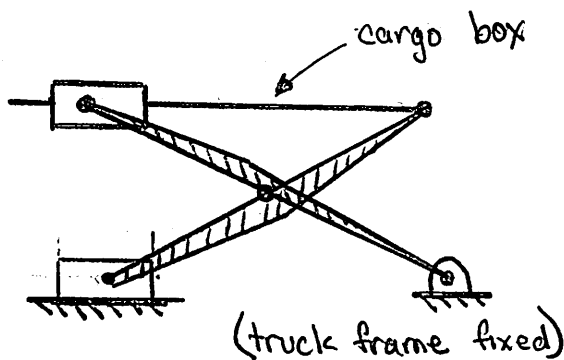
1-13

$n=6, J=7, F=1$

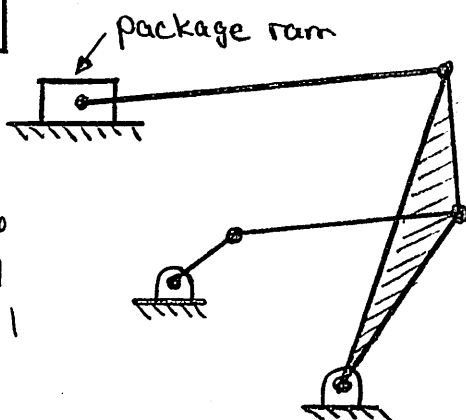


1-14

$n=6, J=7, F=1$

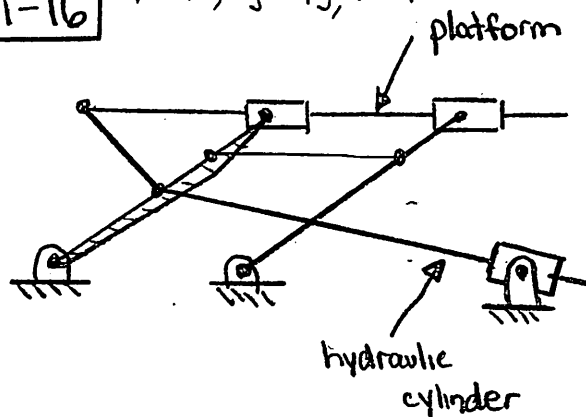


1-15

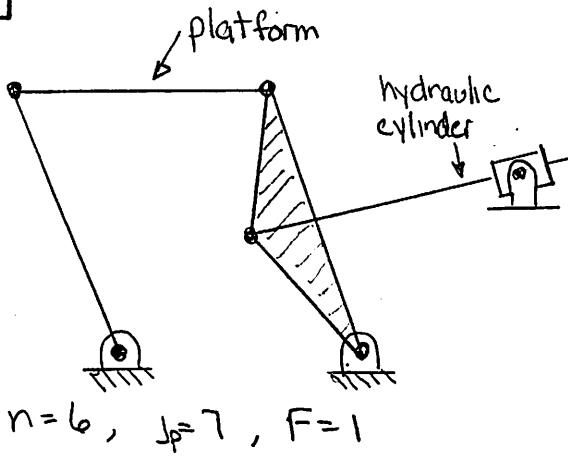


1-16

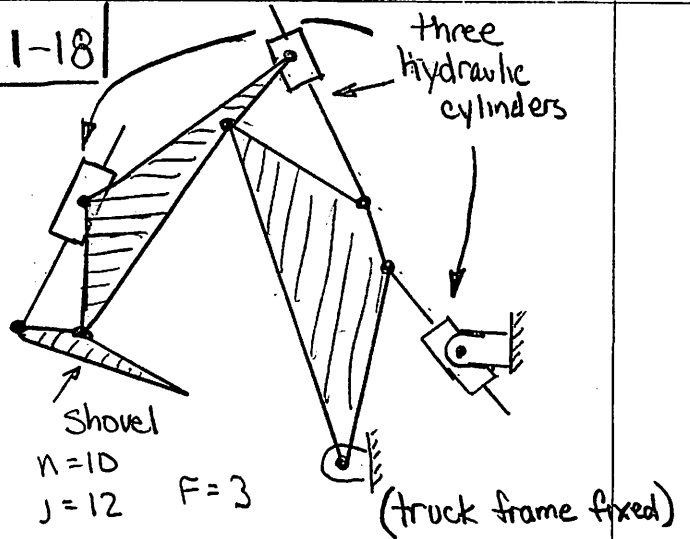
$n=10, J=13, F=1$



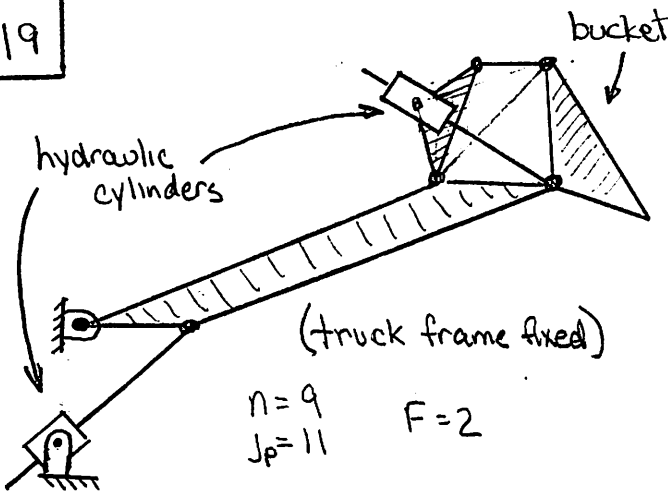
1-17



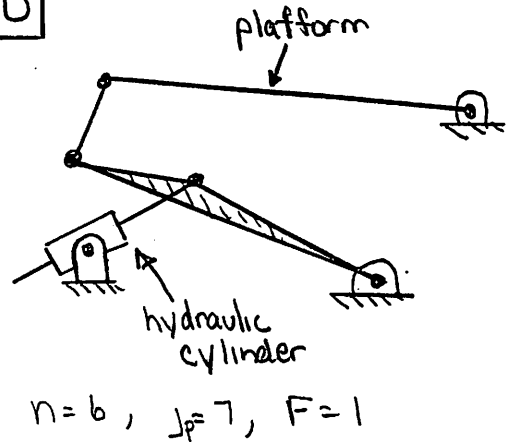
1-18



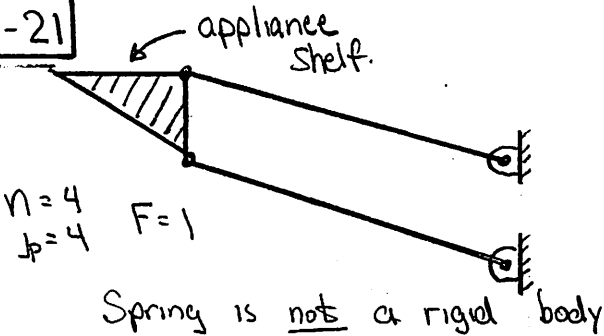
1-19



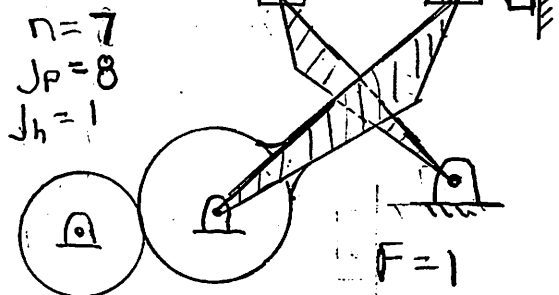
1-20



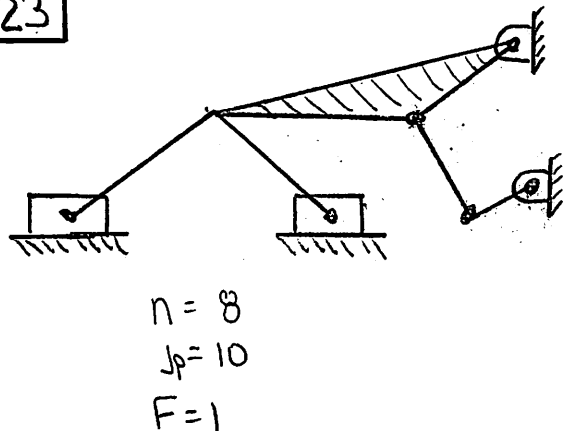
1-21



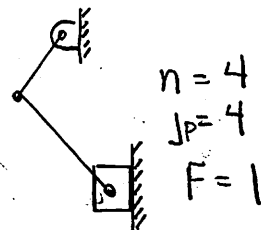
1-22



1-23



1-24



1-43 Links = 10 Joints = 12
(9 pins, 3 sliding)
 $DOF = 3(10-1) - 2(12) = 3 //$

1-44 Links = 9 Joints = 11
(9 pins, 2 sliding)
 $DOF = 3(9-1) - 2(11) = 2 //$

1-45 Links = 6 Joints = 7
(6 pins, 2 sliding)
 $DOF = 3(6-1) - 2(7) = 1 //$

1-46 Links = 4 Joints = 4
(4 pins)
 $DOF = 3(4-1) - 2(4) = 1 //$

1-47 Links = 8 Primary Joints = 10
Higher Joints = 1 (gear) (6 pins, 4 sliding)
 $DOF = 3(8-1) - 2(10) - 1 = 1 //$

1-48 Links = 8 Joints = 10
 $DOF = 3(8-1) - 2(10) = 1 //$

1-49 Links = 4 Simple joints = 4
(3 pin & 1 sliding)
 $DOF = 3(4-1) - 2(4) = 1 //$

1-50 Links = 6 Joints = 7
(6 pins, 1 sliding)
 $DOF = 3(6-1) - 2(7) = 1 //$

1-51 $s = 1.5, l = 14, p = 12, q = 4$
 $s = \text{side}$
 $1.5 + 14 < 14 + 4$
 $15.5 < 18 \text{ (yes)}$
 $\Rightarrow \text{crank-rocker}$

1-52 $s = 4, l = 12, p = 12, q = 5$
 $s = \text{side}$
 $4 + 12 < 12 + 5$
 $16 < 17 \text{ (yes)}$
 $\Rightarrow \text{crank-rocker}$

1-53 $s = 3, l = 12, p = 8, q = 4$
 $s = \text{side}$
 $3 + 12 < 8 + 4$
 $15 < 12 \text{ (no)}$
 $\Rightarrow \text{triple-rocker}$

1-54 $s = 3, l = 12, p = 12, q = 5$
 $s = \text{side}$
 $3 + 12 < 12 + 5$
 $15 < 17 \text{ (yes)}$
 $\Rightarrow \text{crank-rocker}$

Answers to the Chapter 1 Case Study Questions:

Case 1-1.

1. As link A rotates clockwise, 90° , slide C will move to the left.
2. As link A rotates clockwise, 90° , the ball trapped in slide C will drop down the lower, left chute.
3. As link A continues another 90° , clockwise, link A will be oriented straight down and slide C will return to the original position shown in the figure.
4. This device allows one feeder bowl to distribute balls to two separate stations.
5. The chamfers on slide C allow relief as a ball drops into the empty slot as slide C moves under chute D.
6. This device would be useful in that only one feeder bowl will need to be filled and monitored.

Case 1-2.

1. As handle A is rotated counterclockwise, flapper C rotates clockwise.
2. As flapper C is raised, the water in the tank is allowed to flow through the opening.
3. A buoyancy force will offset the water pressure, keeping the flapper in the upper position.
4. As the water level lowers to the level of the flapper, the flapper will lower with the water line.
5. Item D floats on top of the water. As the water level lowers, float D also lowers.
6. As item D rotates counterclockwise, item F is also rotates counterclockwise.
7. Item F is a valve that controls water flow, In the upper position, it fills the tank. In the lower position, water flow is cut off.
8. These mechanisms allow a rapid flow of water from the tank, slowly refill the tank, then shut-off the water flow.
9. The water pressure in residential areas does produce the required flow rate for a water closet.

Case 1-3.

1. In the shown configuration, the water level in bucket B_1 is raising, as the flow into the bucket exceeds the amount that is leaking from the holes at the bottom of the bucket.
2. In the shown configuration, the water level in bucket B_2 is lowering, as the water is leaking from the holes at the bottom of the bucket.
3. If bucket B_2 were forced upward, rocker arm C would rotate clockwise.
4. If bucket B_2 were forced upward, rocker arm R would rotate counterclockwise.
5. Rocker arm R controls a directional valve, channeling the water flow to either the upper pipe or the lower pipe.
6. As water drains from one bucket, making it lighter, and fills the other, making it heavier, the weight shift cases the rocker C to rotate and reverse the direction of the water flow. The process repeats itself and rotates rocker C back to the original position. The continual motion is oscillation of rocker C.
7. As rocker C rotates, channel S moves between left and right positions. This allows the steel rod, which is constantly moving, to be coiled onto a reel placed on the left side or a reel on placed on the right side.
8. Since water is abundant and a common cooling medium in most foundries, water flow can be used to drive some machinery.

Answers to the Chapter 2 Case Study Questions:

Case 2-1.

1. As handle A is rotated, moving threaded rod B to the left, grip C also moves to the left and slightly upward. Notice that links E and F are pivoting in the middle, thus grip C is constrained to a swinging motion.
2. As handle A is rotated, moving threaded rod B to the left, grip D moves to the right and slightly downward. Since links E and F are pivoting in the middle, grip D will have motion opposing grip C.
3. The purpose of this mechanism is to serve as a machining clamp for the workpiece.
4. The spring, G, pulling on link D would cause it to return to an upward and rightward position.
5. The purpose of spring G is, ultimately, to keep a positive contact between the threaded rod and link C.
6. Links E and F have a peculiar configuration to avoid interference with the workpiece, throughout the range of motion of the clamp.
7. Such a device could be called a machining clamp.
8. Since link C is moving in a swinging motion, the rounded end on the threaded rod, assures a consistent point contact with link C.