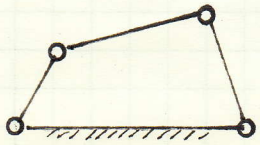
PROBLEM 1.1 DETERMINE THE DEGREE OF FREEDOM OF EACH OF THE FOLLOWING MECHANISMS. IF THE DEGREE OF FREEDOM IS NOT 1, MAKE RECOMMENDATIONS FOR CHANGING THE MECHANISM.

GIVEN:
1. MECHANISMS (a)-(f) BELOW

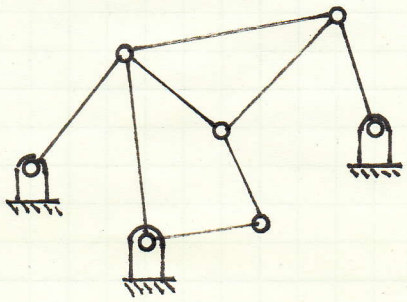
ASSUMPTIONS:
1. GROUND LINKS LOOSE ALL 3 DEGREES OF FREEDOM
2. ALL LINKS ARE RIGID
3. ALL JOINTS ARE FRICTIONLESS

FIND:
1. DETERMINE THE MOBILITY FOR EACH MECHANISM
2. IF THE MOBILITY IS NOT 1, MAKE RECOMMENDATIONS TO MAKE IT 1.

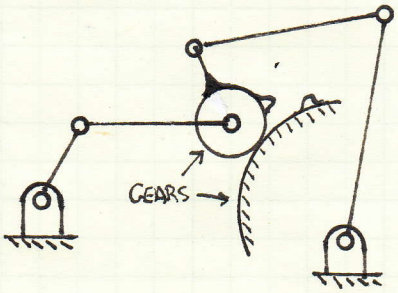
FIGURE:



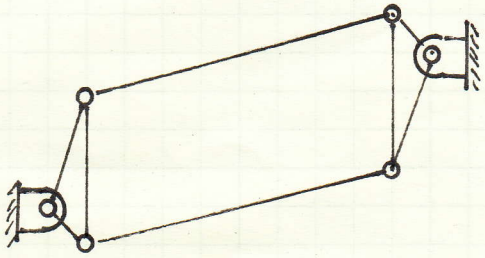
(a) GENERAL 4-BAR



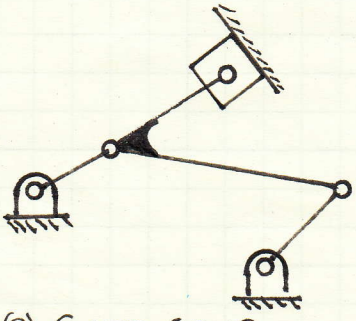
(b) DWELL MECHANISM



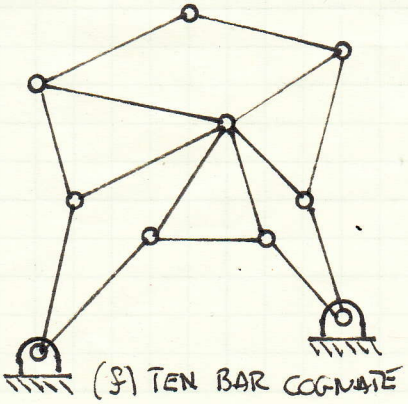
(c) GEARED SIX-BAR



(d) DOUBLE ROCKER



(e) GUIDED SLIDER

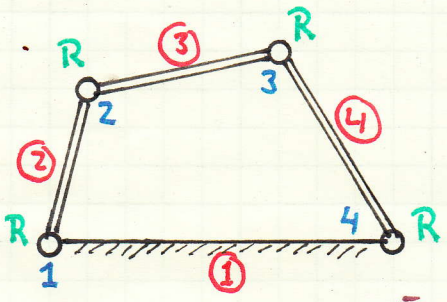


(f) TEN BAR COGNATE

SOLUTION: THE SOLUTIONS TO EACH OF THE PROBLEMS WILL DESIGNATE ON THE FIGURES GREEN FOR THE TYPE OF JOINT, BLUE FOR THE JOINT NUMBER, AND RED FOR THE LINK NUMBER.

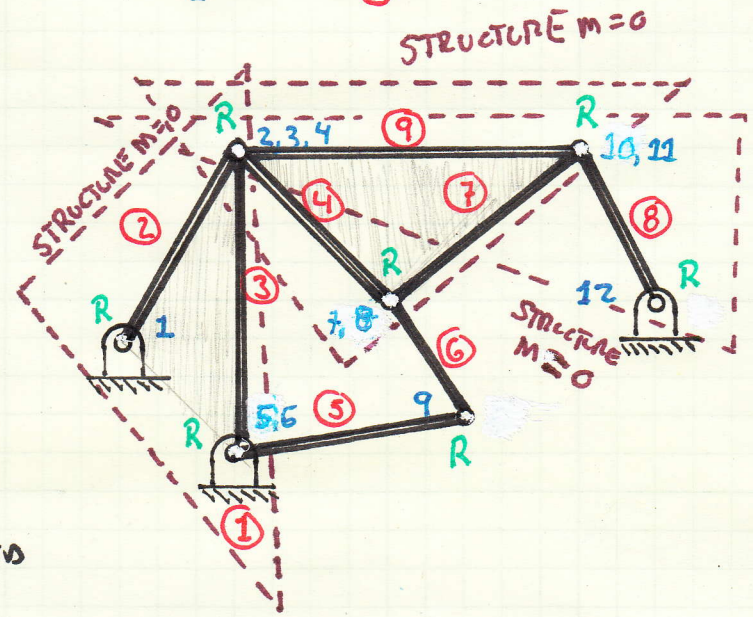
(a) GENERAL 4-BAR

$$M = 3\cdot(L-1) - 2\cdot f_1 - f_2$$
$$= 3\cdot(4-1) - 2\cdot(4) - 0$$
$$= \boxed{1}$$



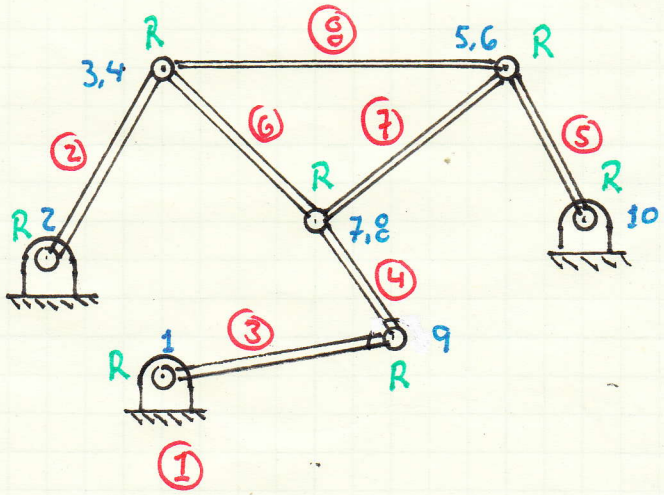
(b) DWELL MECHANISM

$$M = 3(L-1) - 2\cdot f_1 - f_2$$
$$= 3\cdot(9-1) - 2\cdot(12) - 0$$
$$= 3(8) - 2(12)$$
$$= \boxed{0}$$



THIS MECHANISM CAN BE TURNED INTO A M=1 MECHANISM BY ELIMINATING LINK (5)

$$M = 3(L-1) - 2\cdot f_1 - f_2$$
$$= 3(8-1) - 2(10)$$
$$= 21 - 20 = \boxed{1}$$

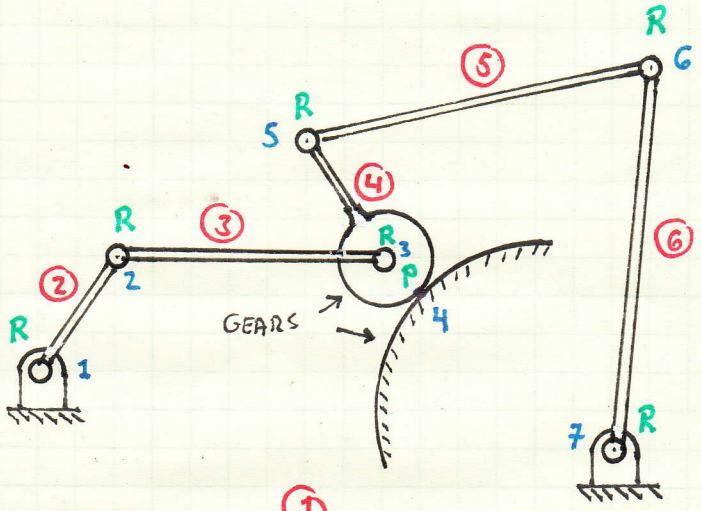


(c) GEARED SIX BAR

$M = 3(L-1) - 2 \cdot f_1 - f_2$

$= 3(6-1) - 2 \cdot (7)$

$= 15 - 14 = \boxed{1}$



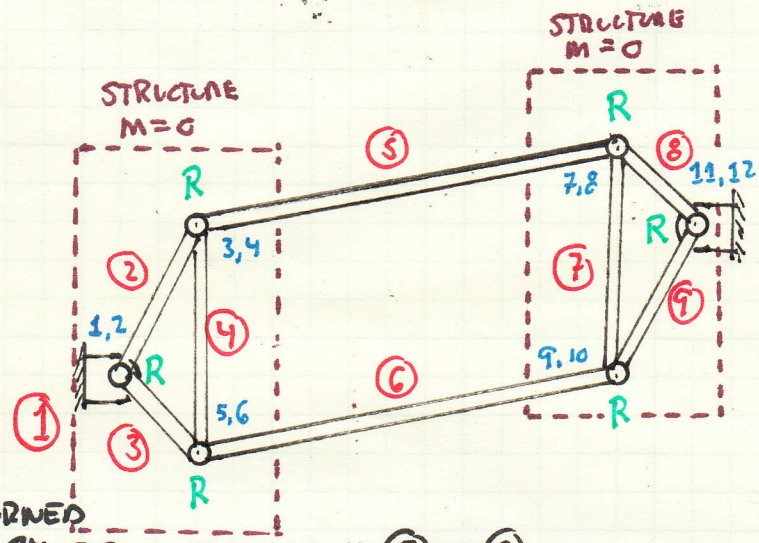
(d) DOUBLE ROCKER

$M = 3(L-1) - 2 \cdot f_1 - f_2$

$= 3(9-1) - 2 \cdot (12) - 0$

$= 3(8) - 2 \cdot 12 = 24 - 24$

$= \boxed{0}$

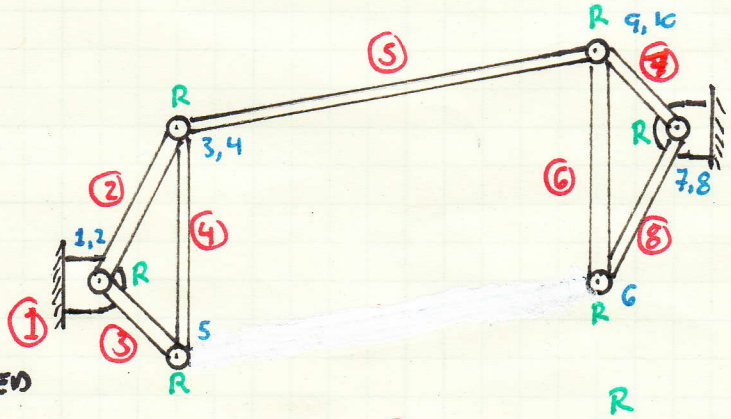


THIS MECHANISM CAN BE TURNED INTO AN M=1 MECHANISM BY ELIMINATING LINK ⑤ OR ⑥

$M = 3(8-1) - 2 \cdot (10) - 0$

$= 3(7) - 2(10) = 21 - 20$

$= \boxed{1}$

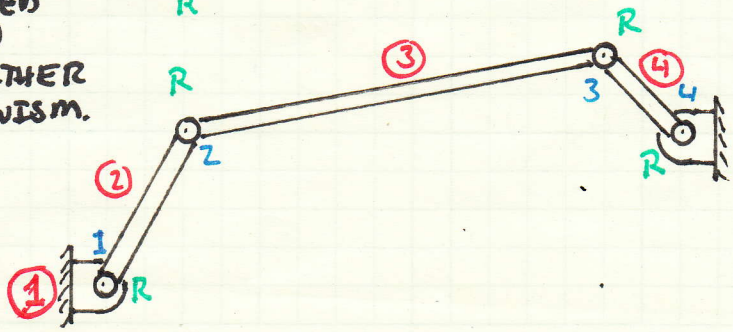


BECAUSE OF THE ~~SE~~ STRUCTURAL COMPONENTS FORMED BY LINKS ②-③-④ & ⑥-⑦-⑧ THIS MECHANISM CAN BE FURTHER REDUCED TO A 4-BAR MECHANISM.

$M = 3(4-1) - 2 \cdot 4 - 0$

$= 3 \cdot (3) - 2 \cdot (4) = 9 - 8$

$= \boxed{1}$

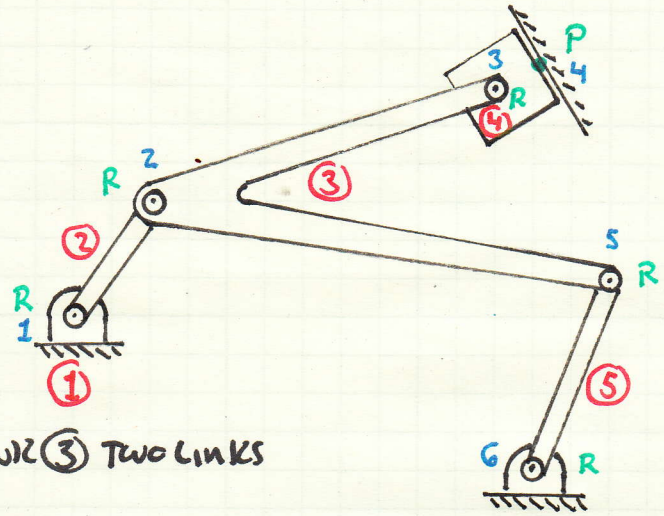


(e) GUIDED SLIDER

$M = 3(L-1) - 2 \cdot f_1 - f_2$

$= 3(5-1) - 2(6) = 12 - 12$

$= \boxed{0}$



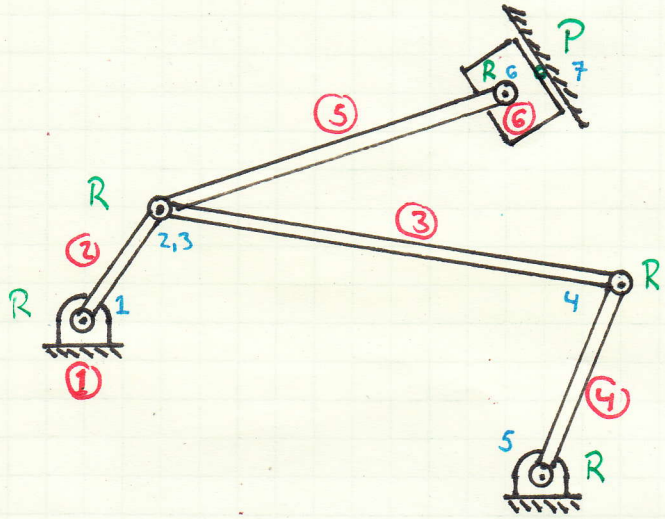
THIS MECHANISM CAN BE TURNED INTO A M=1 MECHANISM BY MAKING LINK (3) TWO LINKS

$M = 3(L-1) - 2 \cdot f_1 - f_2$

$= 3(6-1) - 2(7) - 0$

$= 3(5) - 2(7) = 15 - 14$

$= \boxed{1}$

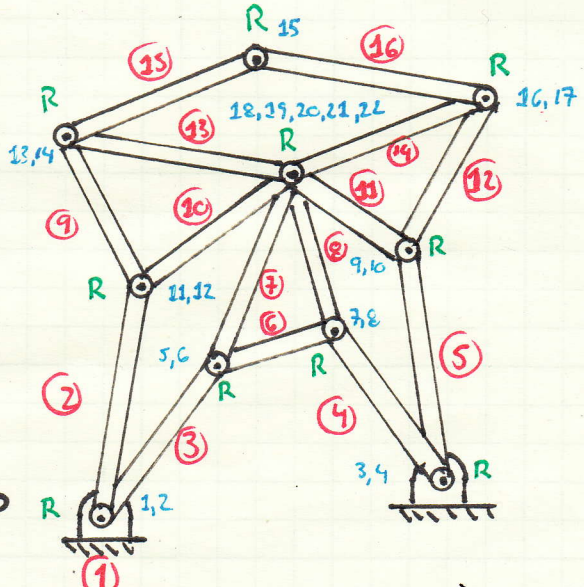


(f) TEN BAR COGNATE

$M = 3(L-1) - 2 \cdot f_1 \cdot f_2$

$= 3(16-1) - 2(22) = 3(15) - 2(22)$

$= 45 - 44 = \boxed{1}$



SUMMARY:

IN THE SOLUTION ALL ~~CONNECTIONS~~ COMPONENTS ARE CONSIDERED SEPERATE LINKS. SOME, LIKE THE ONES IDENTIFIED AS STRUCTURES, COULD BE CONSIDERED TERNARY LINKS; HOWEVER, THE MOBILITY WOULD NOT CHANGE. THE SOLUTIONS TO TRANSFORMING THE STRUCTURES INTO M=1 MECHANISMS ARE ONLY ONE OF THE POSSIBLE SOLUTIONS