

Equilibrium of a rigid body (Free body diagram)

lect # 6

steps

- ① draw the body
- ② put the external forces
- ③ replace supports by reactions

supports

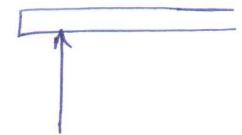


roller



rocker

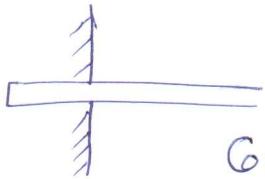
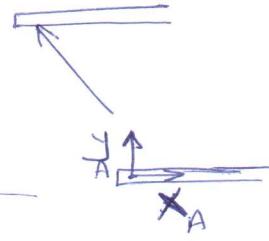
blockage I
surface



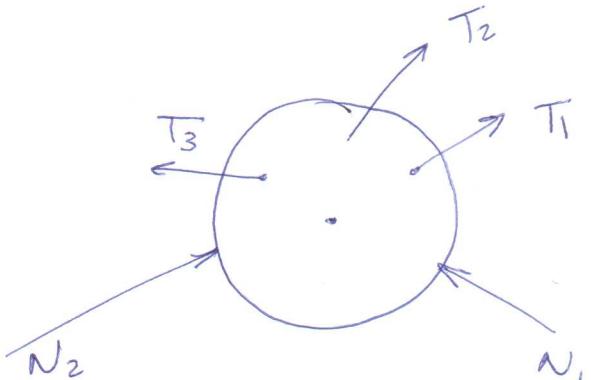
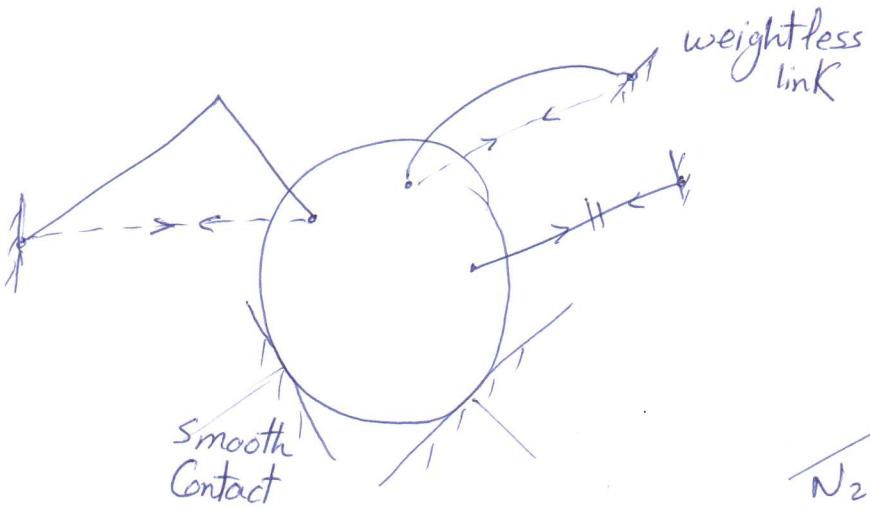
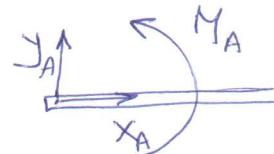
hinge



pin



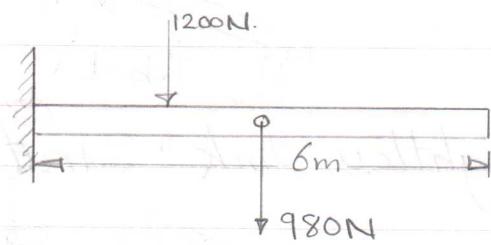
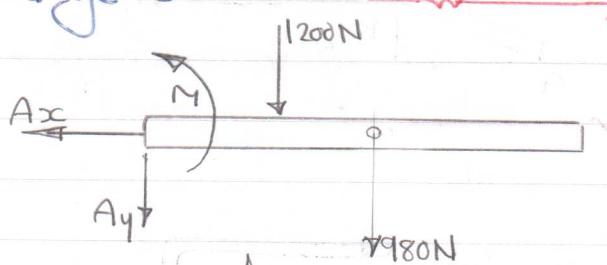
Complete fixation



Equilibrium of a rigid-body.

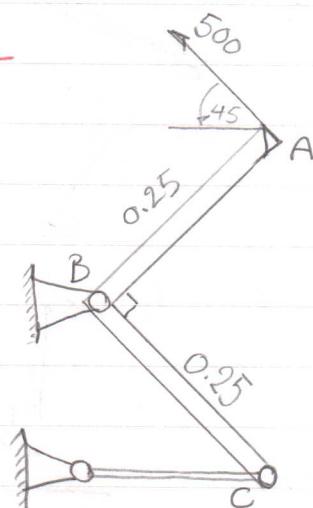
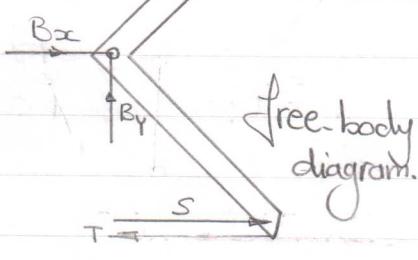
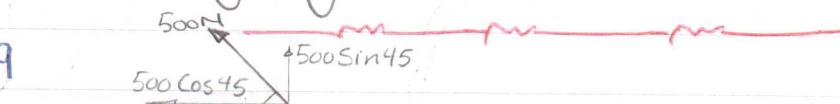
Free-body diagram.

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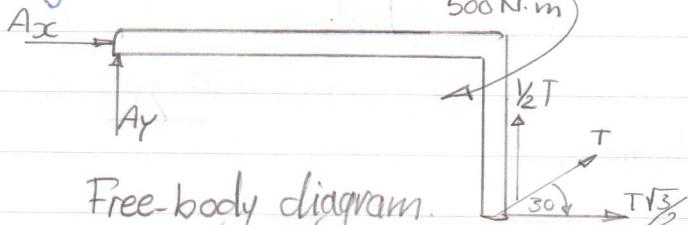


free-body diagram

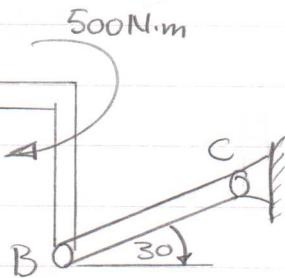
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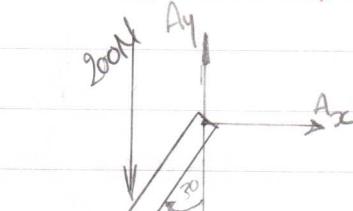
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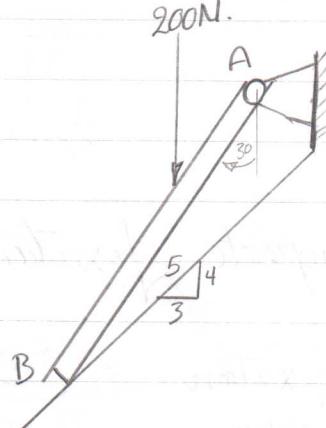
Free-body diagram.



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free-
body
diagram.



Equilibrium of a rigid body

lect # 7

steps

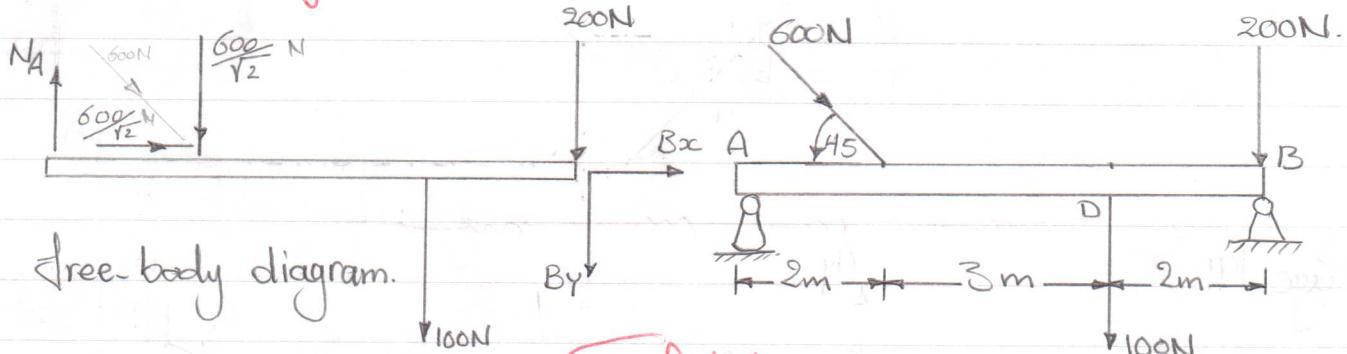
- ① draw the body
- ② put the external forces.
- ③ replace supports by reactions.
- ④ use equilibrium equations.

$$\Sigma F_x = 0, \Sigma F_y = 0, \Sigma M = 0$$

Equilibrium of a rigid body

Equation of equilibrium.

Example ⑥ Page 197



Solution

$$\sum M_B = \text{zero}$$

$$100 \times 2 + 300\sqrt{2} \times 5 - N_A \times 7 = \text{zero}$$

$$N_A = 319 \text{ N.}$$

$$\sum F_{Bx} = \text{zero}$$

$$B_x + 300\sqrt{2} = \text{zero}$$

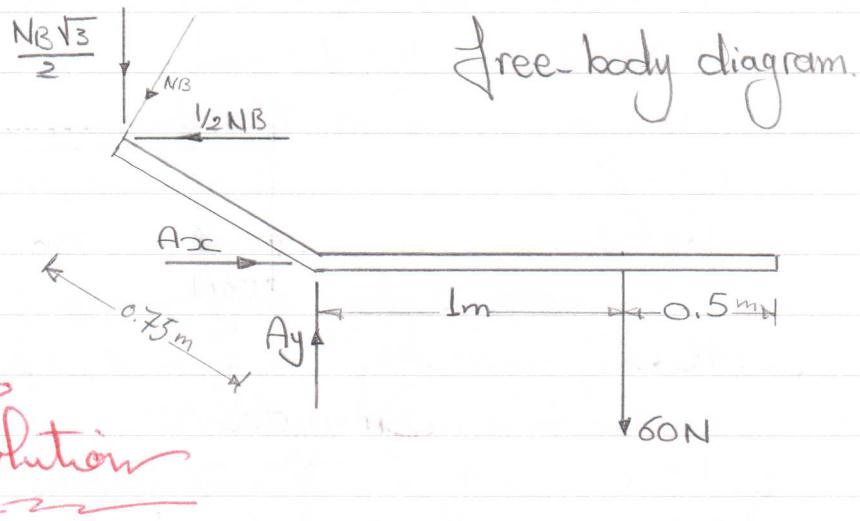
$$B_x = -300\sqrt{2} \text{ N.}$$

$$\sum F_y = \text{zero}$$

$$-200 - B_y - 100 - 300\sqrt{2} + N_A = \text{zero}$$

$$B_y = -405 \text{ N.}$$

Example 10 Page 201



free-body diagram.

Solution

$$\sum M_A = \text{zero}$$

$$-60 \times 1 - 90 + N_B(0.75) = \text{zero}$$

$$N_B = 200 \text{ N.}$$

$$\sum F_x = \text{zero}$$

$$A_x - \frac{1}{2}N_B = \text{zero}$$

$$A_x = 100 \text{ N.}$$

$$\sum F_y = \text{zero}$$

$$-60 + A_y - \frac{\sqrt{3}}{2}N_B = \text{zero}$$

$$A_y = 233 \text{ N.}$$