

Problem 16.162

Two slender rods of length l and mass m , are released from rest in the positions shown. Knowing that a small knob at end B of rod AB bears on rod CD, determine immediately after release

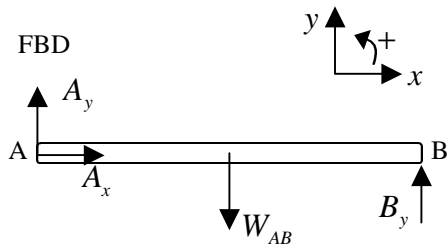
- a) the acceleration of end C of the rod CD
- b) the force exerted on the knob

Step 1 : Identify System: Both Rods

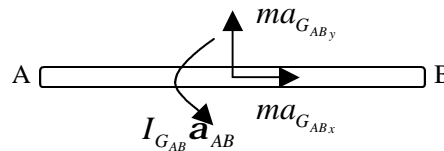
Step 2 : Identify Form of Equations Required: need acceleration and force, therefore use Rate Form

Step 3 : Draw system diagrams according to choice of equation form and identify unknowns : FBD and KD

Rod AB

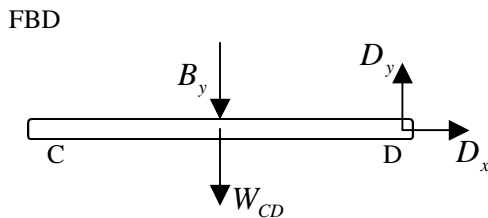


KD

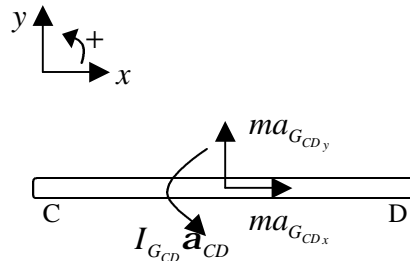


unk	eqs
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Rod BC



KD



Step 4 : Kinetics

Rod AB

COLM(RF) in x-dir $A_x = ma_{G_{ABx}}$ (1)

COLM(RF) in y-dir $A_y + B_y - W_{AB} = ma_{G_{ABy}}$ (2)

COAM(RF) about point G $-A_y \frac{l}{2} + B_y \frac{l}{2} = I_{G_{AB}} a_{AB}$ (3)

Rod CD

COLM(RF) in x-dir $D_x = ma_{G_{CDx}}$ (4)

COLM(RF) in y-dir $D_y - B_y - W_{CD} = ma_{G_{CDy}}$ (5)

COAM(RF) about point G $D_y \frac{l}{2} = I_{G_{CD}} a_{CD}$ (6)