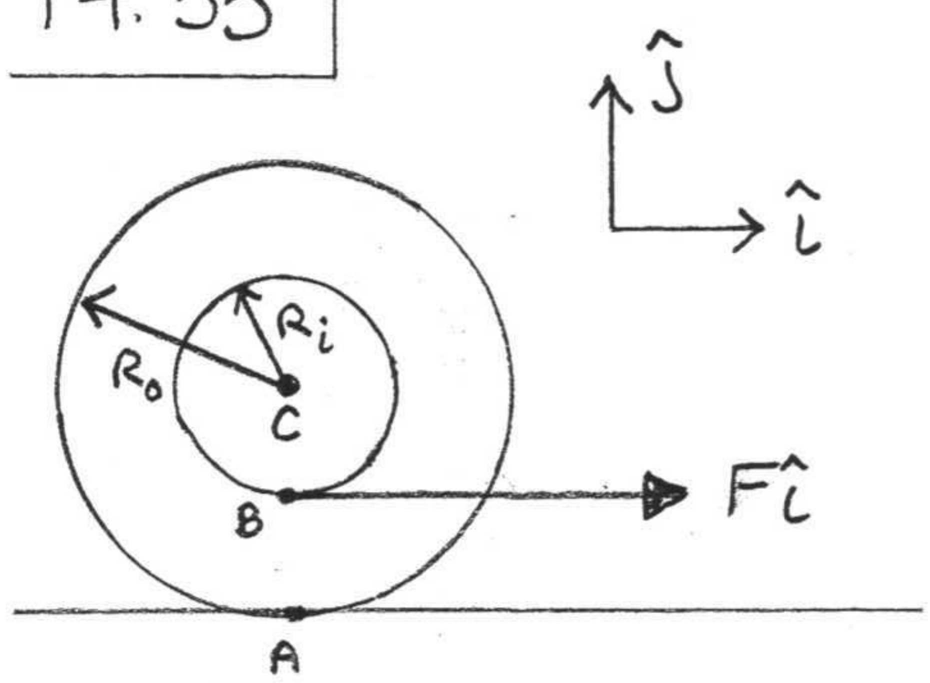
14.35



Assume: no slip
all mass (m) concentrated at centroid, i.e. $I^G = 0$

Kinematics: $\ddot{x}_c = -\ddot{\theta} R_o$

a) $\sum \vec{M}_A = \dot{\vec{H}}_A$ OR $\vec{r}_{B/A} \times F\hat{i} = \vec{r}_{C/A} \times m\vec{a}_c + I^G \dot{\omega} \hat{k}$

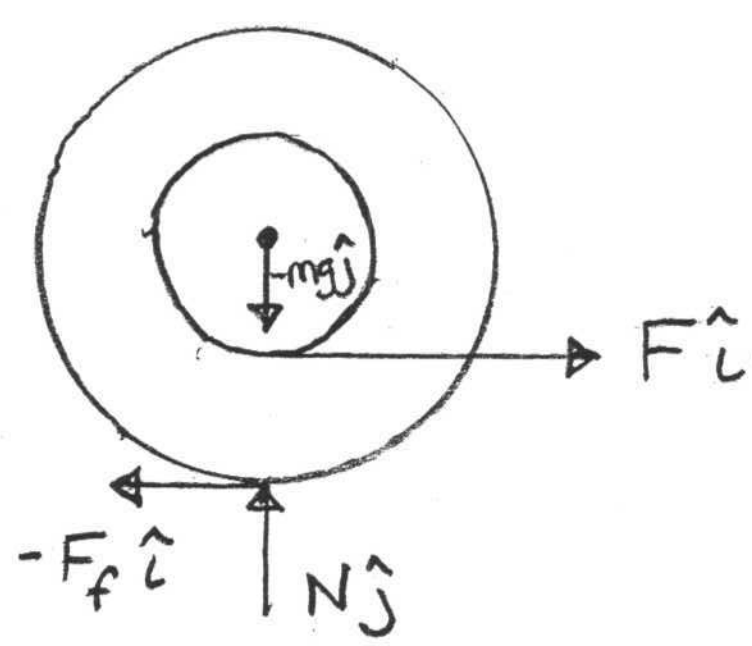
$\rightarrow (R_o - R_i)\hat{j} \times F\hat{i} = R_o \hat{j} \times m a_c \hat{i} + 0$

$(R_o - R_i) F (-\hat{k}) = m a_c R_o (-\hat{k})$

$\{\} \cdot (-\hat{k}) \longrightarrow F(R_o - R_i) = m a_c R_o$

$\therefore \boxed{a_c = \frac{F}{mR_o}(R_o - R_i)}$

b) Free-body diagram:



$\sum \vec{F} = m\vec{a}_c$

$F\hat{i} - F_f \hat{i} + N\hat{j} - mg\hat{j} = m a_c \hat{i}$

$\{\} \cdot \hat{i} \rightarrow F - F_f = m a_c$

$\therefore F_f = F - mac$

$= F\left[1 - \frac{R_o - R_i}{mR_o}\right]$

$\therefore \boxed{\vec{F}_f = -F\left(1 - \frac{R_o - R_i}{mR_o}\right)\hat{i}}$