SESSION 3 GRIFFITHS 8.28 (a) lach q has \overrightarrow{v} = $wR\hat{\phi} + vz\hat{z}$ $F = q(\vec{v} \times \vec{B}) = qk(2\omega Rz\hat{\rho} - Rv_z\hat{\phi} + \omega Rz)$ [↑] on each charge-Net force in $F = \sum_{i=1}^{N} F_i$ As we go cround the circle, the p and o forces coucel out, and de ne on left with in the 2 components ngkWRE ⁼ $M \frac{d^2}{dt^2}$ So we have $\frac{d^2}{dt^2}$ ingle R^2 w (t)

In order to solve this we need w(t) Consider now the torque $\vec{N} = \sum_{i=1}^{n} \vec{r} \times \vec{F} = nR\hat{\rho} \times (-qR\hat{N}^{T})\hat{\rho}$ $N^3 = -nqkR^2v_2$ tis we need $w(t)$
forque
 $R\hat{\rho} \times (-qRR\hat{\theta}_z)\hat{\rho}$
 $T \frac{dw}{dt} \hat{z} = T = \frac{m\omega}{4}me^{2}$
 $\frac{d}{dt}$
 $\frac{w}{dt} = -\frac{nqR}{dt}R^{2}$
 $\frac{d}{dt}$ This then $\frac{dw}{dt}$ - $\frac{ngkR^{2}}{dt}$ d+ $\frac{1}{100}$ this we need w
 $\frac{1}{100}$ to torque
 $\frac{1}{100}$ = $\$ Then using the equation circled in black : $\frac{dw}{dt^2}$ = the equation $\frac{du}{dt^2} = -\frac{1}{4}$ and since $J=\frac{1}{2}MR$

 $\frac{d^{2}w}{dt^{2}} = -2n^{2}q^{2}k^{2}R^{2}w$

Let $\beta = 2n^{2}q^{2}kR^{2} \implies$ $-2 \frac{n^2 q^2 k^2 R}{h^2}$ w $2 \frac{n^2 q^2 k^2 R^2}{h^2}$ = W(t)= We cos be
ack to the equation circled in rea Going back to the equation circled in red $\begin{array}{rcl}\n\frac{d^2w}{dt^2} & = & -2 \frac{n^2q^2k^2R^2}{M^2} \\
\frac{det}{dt^2} & = & \frac{2n^2q^2k^2R^2}{M^2} \\
\frac{d^2w}{dt^2} & = & \frac{2w}{L} \frac{w}{dt} \\
\frac{d^2w}{dt^2} & = & \frac{2mR^2}{M} \frac{dw}{dt} \\
\frac{d^2w}{dt^2} & = & -\frac{2mR^2}{M} \frac{dw}{dt} \frac{w}{dt} \\
\frac{d^2w}{dt^2} & = & -\frac{2mR^2}{M} \frac{dw}{dt$ $\frac{dz}{dt} = \frac{1}{nqkR^2} \frac{dw}{dt}$
 $\frac{dz}{dt} = \frac{1}{12}Mw_0 \sin \theta t$ R ngk= $\frac{\beta R}{\sqrt{2}}$ $Z(t)=\frac{R\omega_{0}}{N}(1-cos\beta t)$ 4 $Z(0)=0$ Check conservation of energy $\frac{1}{2}M\frac{\pi}{3}(t) + \frac{1}{2}J\omega^{2}(t) = E$ But $N_2(t) = \frac{dz}{dt} = \frac{1}{\sqrt{2}} \frac{R}{M}$ wo singt

 $E = \frac{1}{2} m R^2 w_0^2 sin \beta \epsilon + \frac{1}{2} T w_0^2 cos \beta \epsilon$ $E = \frac{1}{2} \frac{MR^2}{2} \omega_0 \sin^2 \phi + \frac{1}{2} (\frac{MR^2}{2}) \omega_0^2 \cos^2 \phi^2$ $E = \frac{1}{2} \frac{MR^2}{2} \omega_0^2 = \frac{1}{2} \frac{1}{2} \omega_0^2$