7-2

证明:

由 Rx(Bx2) + Bx(dxa) + Bx(dxB)=0

11 24 = - (020) x (900) x (Pi) x (Pi) - ((020) x (Pi) x ((Pi x (020))

 $= - (\Omega_c) \times (P_i \times (P_i \times (\Omega_c)))$

7-3

ग्रीमीः

$$\frac{\int_{C}^{2} P_{c} I_{3}^{2}}{\chi_{c}^{2} + y_{c}^{2} + z_{c}^{2}}$$

$$\frac{\chi_{c}^{2} + y_{c}^{2} + z_{c}^{2}}{\chi_{c}^{2} + y_{c}^{2} + z_{c}^{2}}$$

现在成心在在AJ中坐标为Pc=fxc,yc, ZcJT

任-底点在fc3+生的 [Xc, Yc, Zo] , fA3+为[Xa, Ya, Za] ,

则有:

$$X_A = X_C + \chi_C$$

$$Y_B = Y_C + \chi_C$$

$$Z_A = Z_C + z_C$$



对理量的, / PIXa, Ya, Za), 因为验的是同一点? AIx = S. (Ya + Za) p(Xc, Yc, Zd) dV 15) Ya = Ya + Ya , Za = Za + Za DIN= [PI(yc3+20) + (Yc3+Z0) +2(Yc420) dV So Yeyopdu = Ye So Yepdu = 0 = Jxx + m+yc2+2c2) AJy = CJyy+m(X2+72) $\int_{Z_2} = C \int_{Z_2} + m(y^2 + Z_c^2)$ 对随号矩: AJXY = - PROXAYADV AXX XA = XC+XC, YA = YC+XC AJ = - Sp (XcYc + Xcyc + Ycxc + xcyc) dV $= C I_{xy} - m_x x_c y_c$ E129 AJx = Jx2 - mx=2 ATyz = (Iyz - myc 2c 派功代入可咎 $AJ = CI + m(P_c^T P_c I_s - P_c P_c^T)$



(DE)村南心的位置大量:

$$P_{0} = l, \hat{X}_{1} = Il_{1}, 0, 0]^{T}$$

$$P_{0z} = d_{2} \hat{X}_{1} = Il_{1}, 0, d_{2}]^{T}$$

$$P_{0z} = d_{3} \hat{X}_{1} = Il_{1}, 0, d_{2}]^{T}$$

② 将连张量

$$\frac{c}{c} I = 0$$

③天力作用于未流执行器; 机器人基座保护不动

$$\begin{cases} \hat{J}_{s} = [0, 0, 0]^{T} ; & \int_{0}^{\infty} w_{s} = [0, 0, 0]^{T} \\ \hat{J}_{s} = [0, 0, 0]^{T} ; & \int_{0}^{\infty} w_{s} = [0, 0, 0]^{T} \end{cases}$$

$$\begin{cases} \hat{J}_{s} = [0, 0, 0]^{T} ; & \hat{J}_{s} = [0, 0, 0]^{T} \\ \hat{J}_{s} = [0, 0, 0]^{T} ; & \hat{J}_{s} = [0, 0, 0]^{T} \end{cases}$$

向外选代的》1

$$\frac{|\omega_{i}|}{|\dot{\omega}_{i}|} = \frac{1}{2} \frac{|\hat{\omega}_{i}|}{|\hat{\omega}_{i}|} + \frac{1}{2} \frac{|\hat{\omega}_{i}|}{|\hat{\omega}_{i}|} = \frac{1}{2} \frac{|\hat{\omega}_{i}|}{|\hat{\omega}_{i}|} + \frac{1}{2} \frac{|\hat{\omega}_{i}|}{|\hat{\omega}_{i}|} + \frac{1}{2} \frac{|\hat{\omega}_{i}|}{|\hat{\omega}_{i}|} = \frac{1}{2} \frac{|\hat{\omega}_{i}|}{|\hat{\omega}_{i}|} + \frac{$$

$$\frac{m_1 \int_{-\infty}^{\infty} F_1 = m_1 \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \frac{m_1 \int_{-\infty}^{\infty} \hat{\theta}_1^2 + m_1 g S_1}{m_1 \int_{-\infty}^{\infty} \hat{\theta}_1^2 + m_2 g S_1}$$

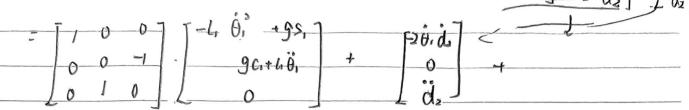
向引选代1→2

$$\frac{\partial}{\partial x} = \frac{\partial}{\partial x} \frac{\partial}{\partial x} = \frac{\partial}{\partial x} = \frac{\partial}{\partial x} \frac{\partial}{\partial x} = \frac{\partial}{\partial x} = \frac{\partial}{\partial x} = \frac{\partial}{\partial x} = \frac{\partial}$$

$$\frac{\partial}{\partial u_2} = \frac{\partial}{\partial r} R' \dot{w}_1 = [0, -\dot{\theta}_1, 0]^T$$

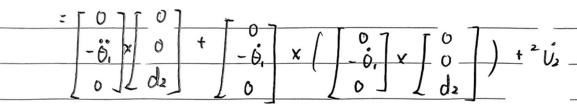
Date / /

$$\frac{2\dot{V}_{2} = \frac{1}{1}R(\dot{w}, \times \dot{0}_{2} + \dot{w}, \times \dot{w}, \times \dot{w}, \times \dot{0}_{2}) + \dot{v}_{3}) + 2\dot{w}_{2} \times \dot{d}_{2} + \dot{d}_{3} + \dot{d}_$$



$$\begin{array}{c|c}
-l, \dot{\theta}, & +gs, -2\dot{\theta}, \dot{d}_s \\
0 & & \\
gc, +\dot{d}_s + l, \dot{\theta}_l
\end{array}$$

$$MJ^2V_{ex} = {}^2W_2 \times {}^2P_0 + {}^2W_2 \times ({}^2W_2 \times {}^2P_0) + {}^2V_2$$



$$= \begin{bmatrix} -\dot{\theta}, dz \\ 0 \end{bmatrix} + \begin{bmatrix} 0 \\ -\dot{\theta}, ^2 dz \end{bmatrix}$$

$$\frac{2J_{2}=\frac{2}{3}R}{\frac{1}{3}+\frac{2}{5}F_{2}}=\frac{2}{F_{2}}F_{3}$$

$$\frac{1}{3}R^{3}R_{3}+\frac{2}{3}F_{2}=\frac{2}{F_{2}}F_{3}$$

$$\frac{1}{3}R^{3}R_{3}+\frac{2}{3}R^{3}R_{3}+\frac{2}{3}P_{02}\times {}^{2}F_{2}+\frac{2}{3}Q_{3}\times {}^{2}R^{3}f_{3}=\frac{1}{3}Q_{2}(-m_{2}l_{1}\dot{e}_{1}^{2}+m_{2}g_{3},-2\dot{e}_{1}\dot{d}_{2}m_{3}-m_{2}\dot{e}_{1}\dot{d}_{2})$$

/

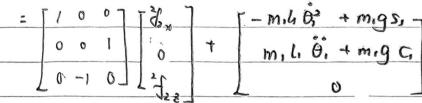
to = 35, 22,

->F3 0

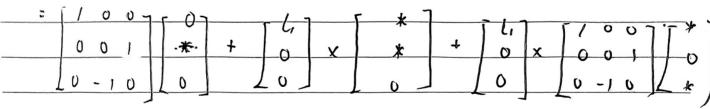
= m=g 0, +m= do - m= bi da + moli 0,

向内选成2→1

J = 1/2 + F



'h = 'N + 2R'n + 'Pa x 'F, + 'O2 x 'R f2



 0 7		0]		0 .	
0	\	O	+	0	
n2thy -]	licmilio,+m,ga)		い- 乳粉2	

 $= \begin{bmatrix} 0, & -d_2(-m_2l_1\dot{\theta}_1^2, +m_2g_{51} - 2\dot{\theta}_1\dot{d}_2m_3 - m_2\dot{\theta}_1\dot{d}_2) + l_1cm_1l_1\dot{\theta}_1 + m_1g_{51} \end{bmatrix}^T$ $+ l_1cm_2g_{51} + m_2\dot{\theta}_3 - m_2\dot{\theta}_1^2\dot{d}_2 + m_2l_1\ddot{\theta}_1)$

 $\frac{T_{1} = \frac{1}{1} n_{1} T_{1}^{T_{1}} = \frac{1}{1} (m_{1} l_{1}^{2} + m_{1} l_{1}^{2} + d_{2}^{3}) \cdot \dot{\theta}_{1} + 2 m_{2} d_{2} d_{3} \dot{\theta}_{1} + m_{3} l_{1} d_{3} + m_{3$

= 5 We I We

RP - CWTCICW



Po = 160-des, listoso, 017

$$V_{\alpha} = \frac{dP_{\alpha}}{dt} = \begin{bmatrix} -l_{1}S, \dot{\theta}, -d_{2}C, \dot{\theta}, -\dot{\theta}_{2}S, \\ l_{1}C, \dot{\theta}, -d_{2}S, \dot{\theta}, +\dot{\theta}_{2}C, \end{bmatrix}$$

記: : k,= jm. Va = jm.li f;

K= = = Vo Va = = = = [163 di di + 26 did + di]

k= k,+ k

\$: u, = m,gl,s,

(= m29 (lis, + d2G)

u= U, +U2

由Lagronge 方程 dak - ak + au = T

m, l, 0, + m2 (li+d,2) 0, + m2 lide 7 (21 (1.) (34 d.) mili bi. a mide

miglia + migelia - disi

 $[(m, l^2 + m_2 c l^2 + d^2)] \ddot{\theta}, + 2m_2 d_2 \dot{d}_3 \dot{\theta}_1 + m_2 l_1 \dot{\theta}_3]$ $- m_2 l_1 \dot{\theta}_1 + m_2 \dot{\theta}_3$

[(m, li2+ m2(li2+ d2)) 0, +2 m2 d2 d30, + m2 lide + m, 9 h a + m2 (lia-ds) m, l, 0, + m, d, - m, b, d, + m, q c,